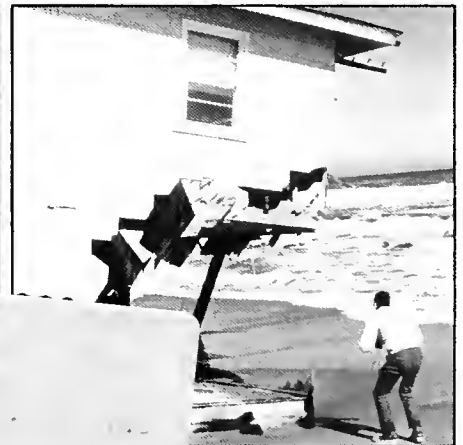


Carolina Planning

Vol. 16, No. 2
Fall 1990



Fifteenth Anniversary Issue

Editor's Note

It's been fifteen years since the first issue of *Carolina Planning* appeared, in the summer of 1975. Many thought the publication would soon fade away as similar student publications had done. *Carolina Planning* has been through some lean times, but it has survived and grown to become, as one person put it, "the oldest and most successful student-run planning periodical in the U.S."

Who can take credit for the longevity and success of *Carolina Planning*? The journal would have never gotten off the ground without the financial support received from various sources. A series of grants made generously by the Z. Smith Reynolds Foundation were responsible for the birth and growth of the publication. The John A. Parker Trust Fund, supported by the contributions of alumni and friends of the Department of City and Regional Planning (DCRP), has provided a solid core of support for many years. The North Carolina chapter of the American Planning Association, which provides a *Carolina Planning* subscription to each of its members, has provided a stable financial base for more than eleven years. Regular subscribers, of course, have been faithful in their support, and the publication has received grants from DCRP and the University of North Carolina from time to time.

The Department of City and Regional Planning has played an important role in *Carolina Planning*'s success. George C. Hemmens, department chairman in 1975, collaborated with students to get the initial grant to start the publication. David Godschalk, chairman from 1978 to 1983, helped the staff negotiate the subscription agreement with the N.C. APA chapter, and has been a faithful adviser and contributor. Other faculty members, including Michael Stegman, Edward Kaiser, William Rohe, Emil Malizia, Shirley Weiss, Harvey Goldstein, Raymond Burby, Jonathan Howes, and Gorman Gilbert, have provided valuable guidance over the years. The contributions of other department staff members, including Bertina Baldwin and Pat Coke, cannot be overlooked (especially in the early years when the text for the journal was produced using typewriters!).

Students, of course, have played a crucial role in the publication's history, both as article writers and staff members. A review of previous issues shows that 105 students have served on the staff since 1975. Four students--Nancy Grden, Jim Miller, John Carroll, and Lee Corum--deserve special recognition for their role in conceptualizing and developing the idea of the journal. Another group of students, those who struggled in the years after the foundation grant was spent and before the agreement with the N.C. APA chapter, also deserves special recognition.

In an introduction to the first issue of *Carolina Planning*, George C. Hemmens wrote, "With the widespread concern over the future of our environment, the current problems of the economy and planning for growth and change, and the widespread concern for efficient and fair government action, the issues of public planning need to be discussed, and the experiences of different local governments, citizen groups, and the university community need to be shared." A look at past issues (as well as the index included in this issue) shows that the journal has met this challenge. Furthermore, this challenge is still potent and pertinent as *Carolina Planning* continues into the 1990s.

Unlike several past issues, this issue of *Carolina Planning* does not present a concentration of articles on a single topic. Instead, the issue contains a variety of articles that address current planning concerns. The issue also takes a look at planning's past in an interview with John A. Parker, the founder of UNC's Department of City and Regional Planning. Mr. Parker discusses the status of planning in the South in the mid-1940s, and explains why the University of North Carolina was a favorable location for a new planning department. An article by Arthur C. Nelson reviews the ambitious statewide land use planning program in Georgia, which makes that state only the second one in the Southeast to "put teeth into statewide planning." In another article, Owen J. Furuseth and Robert E. Altman evaluate the use of two greenways in North Carolina by describing greenway users and their activity patterns.

Three articles in this issue focus on water resources. First, Judith Welch Wegner, drawing on her experience as an elected local government official, discusses the problems and possible solutions for jurisdictions involved in protecting a water supply watershed. Second, Raymond J. Burby and co-authors discuss their evaluation of North Carolina's erosion and sedimentation control program, noting not only its successes but also shortcomings that need attention. Third, R. Paul Wilms discusses the potential effects of global warming and sea-level rise on the coast of North Carolina, and the policy options that may be necessary to respond to these effects.

Three articles discuss ways in which smaller jurisdictions throughout North Carolina are coping with their unique planning needs. David H. Quinn discusses the pilot growth management effort now taking shape in mountainous Avery County. Bruce M. Bortz describes how the town of Nags Head, on the Outer Banks, has taken steps to reduce loss of life and property during coastal storms and to prepare for reconstruction before those storms occur. Watson Brown and Wes Hankins focus on the efforts to combine downtown revitalization, historic preservation, and economic development in the town of Tarboro. (Ironically, Wes Hankins was president of the N.C. APA chapter when the subscription agreement with *Carolina Planning* was negotiated.)

We hope you will put on a party hat, blow out some candles, and enjoy this fifteenth anniversary issue. As always, we invite you to respond to our content and design, and to submit manuscripts for publication in future issues. Thank you for your continued support of our efforts.

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Carolina Planning is published biannually by students in the Department of City and Regional Planning, University of North Carolina at Chapel Hill, with the assistance of funds from the John A. Parker Trust Fund, Department of City and Regional Planning.

Subscriptions to *Carolina Planning* are available at an annual rate of \$10.00, or \$18.00 for two years. Back issues are available for \$6.00 per issue.

Carolina Planning welcomes comments and suggestions on the articles published. We are currently accepting articles for our Fall 1991 issue. Please address all correspondence to: *Carolina Planning*, The University of North Carolina at Chapel Hill, Campus Box # 3140, New East Building, Chapel Hill, North Carolina 27599-3140.

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Cover: Design by Margaret C. Stewart. Photographs by: (top row, from left) Charles Weiss, A. Jay McKeel, and David Godschalk; (middle row, from left) Charles Weiss, David Godschalk, and John Gliebe; (bottom row, from left) Charles Weiss, Curtis Wooten, and the N.C. Dept. of Environment, Health, and Natural Resources.

Layout by Dale McKeel. Printed by the University of North Carolina Printing Department on recycled paper.

Carolina Planning wishes to thank Carroll Carrozza, David Brower, Ray Burby, Pat Coke, Asta Cooper, Bruce Egan, Katherine Gauld, Emil Malizia, Julie McCullough, and the Center for Urban and Regional Studies.

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Carolina Planning

A Student-Run Publication of the University of North Carolina
Department of City and Regional Planning

Volume 16
Number 2
Fall 1990

Anniversary Feature	An Interview with John A. Parker	Carolina Planning Staff	2
------------------------	----------------------------------	-------------------------	---

In the Works	Growth Strategies: The New Planning Game in Georgia	Arthur C. Nelson	4
	Avery County Growth Management Program: The Evolution of Planning in a Western North Carolina County	David H. Quinn	9
	Balancing Environmental Protection and Economic Development: What Do North Carolinians Want?	Frank K. Brown	14
	Pre-Storm Mitigation and Post-Storm Reconstruction: A Plan for Nags Head	Bruce M. Bortz	15

Articles	Watershed Protection: Problems and Possibilities	Judith Welch Wegner	19
	A Report Card on Urban Erosion and Sedimentation Control in North Carolina	Raymond J. Burby, Edward J. Kaiser, Michael I. Luger, Robert G. Paterson, H. Rooney Malcom, and Alicia C. Beard	28
	Greenway Use and Users: An Examination Of Raleigh and Charlotte Greenways	Owen J. Furuseth Robert E. Altman	37
	The Effects of Global Warming and Sea-Level Rise on Coastal North Carolina	R. Paul Wilms	44
	Downtown Revitalization and Historic Preservation In Small Town America: A Case Study of Tarboro, North Carolina	E. Watson Brown Wes Hankins	50

Department News	Faculty Research		55
	1990 Alumni Association Annual Conference		56

Anniversary Supplement	Carolina Planning Index: 1984 to 1990	Margaret C. Stewart John P. Glicke	57
---------------------------	---------------------------------------	---------------------------------------	----

Anniversary Feature

An Interview with John A. Parker

Carolina Planning Staff

To commemorate the fact that the Department of City and Regional Planning at UNC-Chapel Hill has been publishing Carolina Planning for fifteen years, staff editors thought it would be appropriate to explore the early history of the department. In this interview, John A. Parker, the department's founder and its chairman for twenty-eight years, describes how the early planning efforts in the southeastern United States provided the framework for the founding and evolution of the department.

Q: *What was the status of planning in the South when you first arrived at the University of North Carolina? How did the planning needs of the South differ from those of New England, where you had studied and worked previously?*

A: The depression was behind us and World War II was just over when the Department of City and Regional Planning (DCRP) was established in the fall of 1946. The federally funded program of the Tennessee Valley Authority (TVA), established in 1933, was well underway. TVA had powers of direct action in navigation, flood control, and power in the seven Valley states (including North Carolina), as well as programs designed to assist the states in a number of areas, including local, state, and regional planning. By the mid-1940s, state planning agencies and local planning assistance programs had been set up in several of the states, including Tennessee and Alabama. But there was no such program in North Carolina.

In 1945 President Frank P. Graham of the University of North Carolina invited me to come to Chapel Hill the following year to initiate a graduate program in planning. During the intervening year, in preparation for this assignment, it was agreed that I should pursue graduate study in planning at MIT. It was also arranged and agreed upon by President Graham and Frederick J. Adams (head of MIT's City Planning Department), in consultation with TVA, that I should join the community planning staff of TVA for a three-month period during the summer of 1946 before reporting to UNC. During that time I was introduced to all aspects of the TVA program at its headquarters in Knoxville, and was given an opportunity to visit a number of the TVA-supported programs in the seven Valley states.

While at TVA I met F. Stuart Chapin, Jr., an MIT planning graduate and a member of TVA's community planning staff. There was pressure from Chapel Hill to start the graduate planning program that September--so, needless to say, every spare moment of my time during that summer at

TVA was devoted to developing the program. Fortunately for me, I found Stu as interested as I was in developing the planning curriculum. He gave generously of his time and was responsible for much of its contents. Little did we realize at the time that within three years Stu would be joining us at Chapel Hill to begin his outstanding career of education and research in planning.

Another outcome of my rewarding summer at TVA had to do with James M. Webb, a California architect and classmate of mine in the planning program at MIT, where he quickly emerged as the outstanding student in all aspects of the program having to do with design, architecture, engineering, and site planning. Jim and I had many discussions relating to plans for the new program at Chapel Hill, and it soon became apparent that his expertise would fill a much-needed gap in the program. Fortunately he was interested in teaching--especially if it could be combined with practice. At that time UNC had funds for only one faculty member--me. But TVA devised a plan where Jim would be employed by TVA to devote part of his time to the university and part to providing local planning assistance to the Tennessee Valley area of western North Carolina. Jim accepted the offer and arrived at UNC on January 1, 1947. Among his architectural and planning projects, Jim's firm, City Planning & Architectural Associates (which he formed with two DCRP alumni, Bob Anderson '60 and Don Stewart '54), developed the site plan for the Research Triangle Park.

In answer to your question regarding the difference in the planning needs of the South as compared to New England in the mid-1940s, I would say that the South was (and largely still is) rural with relatively few metropolitan areas. Many small communities were unable to afford the services of a full-time planning staff or even part-time consulting services. As viewed by TVA, the answer to the problem was to encourage the states to establish state planning commissions, whose responsibilities would include a community planning program staffed with professionals who would be

made available to the state's communities on request. North Carolina had no such program, and one was badly needed. It was hoped (and soon proved to be true) that the new graduate program would--by its very existence--encourage the state to make local planning assistance available.

For some time the state universities in the South had played a major role in providing services to the state's communities, and the record of the University of North Carolina had always been outstanding in this respect. While the new department at Chapel Hill was not a service organization, from its beginning students were assigned to communities on demonstration projects which always involved local citizens and officials. These projects were generally enthusiastically received, and the results were given serious consideration--more so than I would have expected under similar circumstances in New England at the time.

Q: *Why was the University of North Carolina such an attractive place to locate a new planning program?*

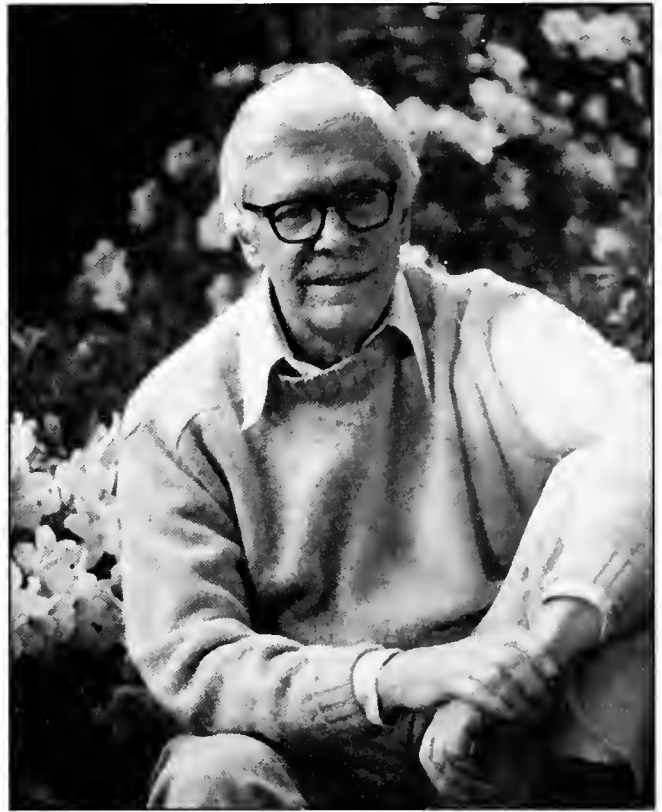
A: There were a number of reasons. At that time there was no educational program in the South offering courses in city and regional planning. UNC-Chapel Hill was one of the region's outstanding educational institutions, with an enviable reputation of service to the state and its neighbors through the efforts of Howard Odum, Rupert Vance and others on the staff of the Institute for Research in Social Science. Chapel Hill had become the South's center for regional study and regional research. In addition to these assets there were two more: (1) UNC's attractive campus and the Chapel Hill community; and (2) probably more important than all of the above, the leadership of UNC President Frank P. Graham, who had received national and international recognition as an outstanding, courageous, imaginative educator, and whose enthusiasm and support for the establishment of a planning program were irresistible.

Q: *When the Department of City and Regional Planning was started at UNC, was the focus primarily on land use planning?*

A: Land use planning was the major focus and continued to be for the first twenty years--into the mid 1960s. By that time several changes were taking place which would have their effects on departmental course offerings and program requirements.

The introduction of the doctoral program brought with it new course offerings in theory and methodology. New faculty members Ralph Gakenheimer and Maynard Hufschmidt developed new courses to provide greater depth in the areas of transportation planning, and regional and environmental planning. And new training grants brought new course offerings in social policy planning and comprehensive health planning.

In order to provide additional flexibility that would enable students to pursue special interests in greater depth, and reflecting trends in the planning profession, it was in-



John A. Parker

evitable that requirements in the core courses would be reduced, and that additional areas of concentration would become available.

Q: *Of the many visiting lecturers and advisors brought to the department (exclusive of DCRP alumni) during your years as chairman, who in your opinion made the most significant contributions?*

A: From TVA: *Gordon Clapp*, chairman of the board; *George Gant*, general manager; *Aelred J. Gray*, chief community planner; and *Rudolf Mock*, chief architect. From New York, by way of N.C. State: *Lewis Mumford*, author, and *Matthew Nowicki*, architect. From Washington: *Bertram Gross*, President's Council of Economic Advisors; *Joseph L. Fisher*, Resources for the Future; and *Carl Feiss*, Housing and Home Finance Agency. From England: *William A. Robson*, London School of Economics, and *F.J. Osborn*, Town and Country Planning Association.

From Harvard, *John M. Gaus*, Littauer Center, and *Arthur Maass*, Center for Public Administration. From MIT: *Kevin Lynch*, *Lloyd Rodwin*, and *Larry Susskind*. And from other parts of the country: *Catherine Bauer Wurster*, Berkeley; *Dennis O'Harrow*, executive director of ASPO; *Harvey Perloff*, UCLA; *Hugh Pomeroy*, Westchester County, New York; *Hans Blumenfeld*, University of Toronto; *Louis Kahn*, University of Pennsylvania; and *Jean Canaux*, International Federation for Housing and Town Planning. □

In the Works

Growth Strategies: The New Planning Game in Georgia

Arthur C. Nelson

In 1989, Georgia adopted an innovative statewide land use planning program known as Growth Strategies. The author notes that North Carolina's Coastal Area Management Act served as one model for Georgia's program. This article describes the passage of this legislation and the application of Growth Strategies in Georgia.

In 1989, the Georgia Legislative Assembly passed, and Governor Joe Frank Harris signed into law, HB 215, otherwise known as *Growth Strategies*. On October 1, 1990, administrative rules known as the Minimum Planning Standards and Minimum Environmental Standards, specially adopted by the legislature, went into effect. These standards are to be used by all Georgia cities and counties to produce land use plans that comply with Growth Strategies. There are rewards for compliance and penalties for noncompliance. These actions make Georgia only the second state in the South to put teeth into statewide land use planning. Governor Harris received the American Planning Association's 1990 Outstanding Elected Official Award for his leadership role in developing and implementing Growth Strategies.

Why has Georgia embarked on such an ambitious course? How is it different from other states? How does it work? What are the prospects for long-term success in managing growth statewide?

Background

Until recently, Georgia could not be described as a leader in land use planning. Indeed, its 1983 constitution prohibits the state government from interfering in local zoning questions, but the constitution does allow the state to mandate land use planning. Georgia nevertheless has a long tradition of regional approaches to land and economic development. The state has one of the nations most exemplary coastal zone management programs, for instance.

Georgia also has one of the nation's most pro-active and multi-faceted regional planning programs. It is perhaps more out of necessity than progressive thinking that for nearly thirty years many local economic development and planning activities have been supported, coordinated, and undertaken by eighteen Regional Planning and Development Centers (RPDCs). Georgia has 159 counties, more

than any other state east of the Mississippi (and second only to Texas in total numbers), and about 550 active municipalities. More than 95 percent of all cities have populations under 10,000; more than 70 percent of the counties have populations less than 15,000. There are about 3,000 elected city and county officials; fewer than 10 percent serve full time.

The RPDCs offer a wide range of services these smaller local governments cannot afford on their own. Local governments have worked within the RPDC system for thirty years. It is a system that is understood and trusted principally because it delivers services and has become a forum for constructive decision-making among local cities and counties.

Entering the 1990s, however, there was a perception among business and government leaders that improvements could be made to existing mechanisms of coordinating government and development investments. A decade of rapid economic development and population growth had stretched infrastructure to its limits and beyond. As John Sibley, the governor's special assistant responsible for pulling together the Growth Strategies legislation, stated in a speech before Georgia's Association of County Commissioners in 1989, Georgia business and government leaders were concerned that the "devil they didn't know was better than the devil they knew." The devil they knew was government at all levels incapable of fairly apportioning infrastructure and other resources to accommodate development. The devil they trust more is Growth Strategies.

Arthur C. Nelson, AICP, is associate professor of public policy, city planning, and international affairs at the Georgia Institute of Technology, where he teaches courses in land use planning, real estate, and economic development. He is currently the Planner's Notebook editor for the Journal of the American Planning Association.

Governor Harris began his second term in 1987 with a pledge to pursue quality growth patterns by forging a new kind of partnership between state, regional, and local governments. The governor appointed a 35-member Growth Strategies Commission and charged it with recommending a course of action for Georgia's future growth and development. The commission met several times throughout the state in highly advertised public hearings. The commission also enlisted several hundred volunteers to serve on a variety of policy groups, addressing land use planning, environmental protection, economic development, and uses of advanced technology.

The Growth Strategies legislation and the implementing rules codified as the Minimum Planning Standards and the Minimum Environmental Standards developed from the commission's work.

What is Growth Strategies?

Growth Strategies requires local cities and counties to prepare comprehensive land use plans consistent with the state's minimum planning and environmental standards. Coordination among plans is done at the regional level through Regional Development Centers (RDCs), which replace the RPDCs, and is accomplished in three ways. First, RDCs prepare regional development plans that give general planning direction principally to "regionally important resources." Second, city and county plans must be consistent with regional plans. Disputes among local governments and between local governments and RDCs are to be settled at the regional level, if possible. Third, disputes that cannot be resolved are to be mediated at the state level by the Georgia Department of Community Affairs (DCA).

There is the additional dimension that regional development plans need to be consistent with each other. Inconsistencies that cannot be resolved among disputing RDCs are mediated at the state level by the DCA.

Interestingly, consistency of city and county land use plans with regional development plans is optional. Cities and counties need not plan; nor plan consistently with regional development plans. However, local governments whose plans are deemed inconsistent with minimum plan-



Under Growth Strategies, Georgia's eighteen Regional Development Centers (RDCs) will prepare regional development plans and review county and municipal land use plans.

ning standards and regional development plans are ineligible to receive state infrastructure funds, whether borrowed or granted. These local governments also may not assess development impact fees or other development exactions.

The aim of Growth Strategies is to realize goals in five general areas. These goals, drafted by the author, have been codified in the administrative rules as follows:

1. *Economic Development:* To achieve a growing and balanced economy, consistent with the resources of this state and its various regions, that equitably benefits all sections of the state and all segments of the population.
2. *Natural and Historic Resources:* To conserve and protect the environmental, natural and historic resources of Georgia's communities, regions, and the state.
3. *Community Facilities:* To ensure that public infrastructure facilities serving local governments, the region, and the state have the capacity and are in place when needed

to support and attract growth and development and/or maintain and enhance the quality of life of the residents of the state.

4. *Housing*: To ensure that all people within the state and its various regions and communities have access to adequate and affordable housing.
5. *Land Use*: To ensure that the land resources of the state are allocated for uses required to facilitate the topical areas of economic development, natural and historic resources, community facilities, and housing as outlined above, and to protect and promote the quality of life of the people of Georgia's communities, regions, and the state.

How Does Georgia's Approach Differ?

Georgia's approach differs from the mainstream model of statewide land use planning. States that pursue coordinated statewide land use planning typically implement planning through a single state agency and all local plans must be deemed consistent with state policy by that agency. This approach is used by Florida, Hawaii, and Oregon, and will soon be used by Connecticut, Maine, and Rhode Island. In Georgia, however, coordination is done solely at the regional level. The primary role of Georgia's statewide agency is to help settle disputes. DCA is not in the business of reviewing plans for consistency except in the case of disputes.

It is possible that Georgia's approach can become the new mainstream model for the simple reason that statewide planning coordinated through a single state agency may not be politically possible in most states. Indeed, in Georgia, decentralizing coordinated planning to the locally trusted and long-proven RPDCs created the favorable political climate needed to assure passage of Growth Strategies. Many other states have equally trusted and generally competent regional agencies. In those states the Georgia model may be more politically feasible than the highly centralized models evolving out of Florida and Oregon.

What Are the Responsibilities of Local Governments?

To implement Growth Strategies, local governments must go through a series of simple planning steps. While many local governments already have plans that are consistent with the regional development plans, most smaller governments have no such plans at all. Growth Strategies establishes minimum planning standards partly in an effort to educate local governments in planning.



Governor Joe Frank Harris advocated and lobbied for the Growth Strategies legislation.

The process is characterized by three simple and logical steps:

First, communities need to prepare a basic planning inventory and assessment. In preparing this assessment, governments must ask:

What do we have as a community?

Is what we have adequate?

Second, communities use the inventory and assessment to prepare a statement of needs and goals. In this step, two more questions are addressed:

What do we need as a community?

What do we want as a community?

The third step concerns implementation. Communities must ask one final question:

How are we going to get there?

Plans are decidedly action-based. Cities and counties must prepare five-year Short Term Work Programs that list specific actions to be taken in the areas of economic development, land use management, and infrastructure improvements. Communities must also prepare twenty-year comprehensive plans that provide general guidance to short-term actions. Table 1 outlines the data, assessment, and decision requirements imbedded in the minimum planning standards. These standards guide communities throughout the process of preparing land use plans. Communities can refer to the administrative rules of the minimum planning standards for more detailed direction on what data to collect, how to assess it, and how to derive implications for planning.

The Five Steps Toward Consistency

Plans are deemed consistent with regional development plans and the minimum planning standards when they receive certification from the DCA. The DCA bases its certification decision on the recommendation of the sponsoring RDC. There are five steps in the certification process.

Step 1: Certification of Existing Plans

Many communities already have plans. The RDCs and the DCA are now determining the number of pre-existing plans. These plans must be formally submitted for review against the minimum planning standards. If the plans comply, certification will be given; if they do not comply, the sponsoring RDC and the DCA will provide the community with specific recommendations.

Table 1. Minimum Planning Standard - Inventory and Statement of Needs and Goals**Step 2: Presubmission Process**

Most communities will need to start from scratch. To begin the planning process, local governments must meet minimum presubmission requirements, most of which pertain to public participation. Growth Strategies requires at least one public hearing during the development of the plan and another to solicit citizen review and reaction to a draft version. Local governments then submit the plans to the RDC for review, comment, and recommended changes.

Step 3: Regional Development Center Review

The RDC reviews all local plans within their multi-county jurisdictions for compliance with the minimum planning standards and regional development plans. As an important part of this process, neighboring local governments are invited to review and comment on plans and the RDC holds a public hearing to solicit citizen views from throughout the region. The RDC then makes its determination to approve the plan as submitted, approve it subject to certain specific conditions being met, or return it to the local government, noting conflicts and recommended modifications. In the latter two cases, the local government can request a reconsideration hearing. Disputes involving local governments and RDCs can be forwarded to the DCA for mediation at any time by a local government, an RDC, or the DCA itself. Since submittal of all plans at the same time would overwhelm the review process, each RDC will devise a staggered plan submission schedule for local governments within its region.

Step 4: Local Government Action

Once a local plan is deemed in compliance, the local government receives DCA certification and can formally adopt

the plan. If the RDC determines that a plan does not comply, the local government can pursue a number of options. The first is to disagree with any comments or recommendations offered by the RDC and request mediation with DCA. The second is to accept any conditions and comply with the recommendations of the RDC and then adopt the modified plan. The third option, when the DCA recommends significant changes, is to make those changes and resubmit the plan for review by the RDC. Finally, the local government may adopt its plan and simply disagree with the RDC and any mediation recommendation of the

<i>Basic Plan Element</i>	<i>Inventory "What do you have as a Community?"</i>	<i>Statement of Needs and Goals "What do you want as a Community?"</i>
Population	<i>Population:</i> 1960 / 1970 / 1980 <i>Characteristics:</i> # of Households Education Age / Sex / Race Income <i>Where do they live?</i>	<i>Population:</i> 1990 / 2000 / 2010 <i>Characteristics:</i> # of Households Education Age / Sex / Race Income <i>Where will they be living?</i>
Economic Development	<i>Assessment of past and present labor force:</i> # of Workers Place of work Wage levels Training, skills Unemployment <i>Assessment of the economic base:</i> Manufacturing Military Commercial activity Service Tourism Warehousing Recreation Shipping Agribusiness	<i>Forecast and analysis of the labor force:</i> # of Workers Place of work Wage levels Training needs Skills needed <i>Forecast and analysis of the economic base:</i> Manufacturing Military Commercial activity Service Tourism Warehousing Recreation Shipping Agribusiness
Natural and Historic Resources	<i>Assessment of any special or significant natural resources:</i> Coastal areas Parks Scenic views Minerals Agricultural land <i>Assessment and location map of historic resources:</i> Landmark buildings Cultural sites Rural resources Residential districts	<i>Conservation and enhancement strategies for these natural resources:</i> Coastal areas Parks Scenic views Minerals Agricultural land <i>Preservation, development, and protection strategies for these significant historic resources:</i> Landmark buildings Cultural sites Rural resources Residential districts
Community Facilities	<i>Inventory of existing facilities:</i> Water supply Education Sewerage Human services Drainage Cultural areas Transportation Recreation Solid waste Government Public safety <i>Assessment and analysis of facility:</i> Capacity Service Area Location	<i>Future facility needs:</i> Types of facilities needed Adequacy of existing facilities Service areas of facilities Life cycle of new facilities <i>Assessment of external factors that may affect facilities planning</i>
Land Use	<i>Map and analysis of existing land uses:</i> Residential Government Commercial Recreation/parks Industrial Natural/vacant Agricultural Undeveloped <i>Existing housing supply and demand:</i> Affordability Type Household size Tenure Condition and age	<i>Future land use strategies with map and policies:</i> Residential Government Commercial Recreation/parks Industrial Natural/vacant Agricultural Undeveloped <i>Future housing supply and demand:</i> Affordability Type Household size Tenure Condition and age

DCA. In all cases, the RDC notifies the DCA whenever a local plan is formally adopted. If the RDC recommends certification to the DCA, the DCA certifies the plan.

Step 5: Plan Updates or Amendments

The last step really becomes a first step. Growth Strategies requires communities to update their plans every ten years, but five year updates are formally recommended. The procedures for original plans also apply to all updates or amendments. The local government must give public notice and hold a public hearing on any plan update or amendment, or any change to the short-term work program. The RDC reviews the change for compliance with minimum planning standards and regional development plans. If necessary, the local government modifies the update or amendment as recommended by the RDC prior to adoption. Furthermore, every five years the local government prepares a formal report on the status of the short-term work program.

Penalties for Noncompliance

To be effective, state planning mandates must impose real penalties on local governments if they fail to prepare plans consistent with state policy. In Oregon, for example, the usual penalty has been to impose building moratoria until substantial progress is made in planning. In Florida, local governments can lose state revenue sharing funds.

In Georgia, there are no direct penalties; however, jurisdictions with plans that are not consistent with minimum planning standards do not qualify for state loans or grants for water or wastewater systems, and certain road projects. Local governments that lack a certified plan cannot impose development exactions or impact fees.

What are the Prospects For Long-Term Success?

Growth Strategies is here to stay. The use of regional agencies to determine compliance is a small stroke of genius. The RDCs have long been positive influences on local government in Georgia, and most are staffed with Georgia Institute of Technology and University of Georgia extension faculty. RDCs are trusted by local governments, and they are unusually competent. For these reasons alone, Growth Strategies is likely to be successful.

Growth Strategies will also be successful because its planning requirements are modest. The minimum planning standards require only basic planning. Unlike Florida and Oregon, which have nineteen and thirty-two goals respectively, Growth Strategies has but five goals. While planning criteria in Florida and Oregon exceed fifty pages of formal administrative rules, the minimum planning standards under Growth Strategies take up only eleven pages. There are considerably fewer criteria used to judge the compliance of local plans. Over time, however, the mini-

mum planning standards may increase as the technical abilities of local governments improve.

But there are uncertainties which will become more apparent as plans are approved and disputes move to the courts. What happens, for example, if a local government rezones land in a way that is inconsistent with a plan? The Growth Strategies legislation does not empower the DCA or the RDCs to appeal those rezonings. It is not clear whether local governments with certified plans can challenge the actions of other local governments that lack certified plans. Nor is it clear the extent to which individual citizens can challenge development decisions that are inconsistent with the local plans, certified or not.

Potentially more messy are development decisions made by local governments based on plans that are not in compliance with minimum planning standards or, worse, not even consistent with uncertified local plans. There is also the possibility that conflicts of interest may emerge within RDCs. In many cases, RDCs will be contracted by local governments to prepare plans. Yet, the same RDCs preparing those plans also determine whether they are in compliance with minimum planning standards and the regional development plan. More problematic is the possibility that a plan prepared by a local government may be inconsistent with a neighboring plan prepared by an RDC, and it is the RDC that makes the preliminary determination of which plan is deemed consistent.

Those involved with the Growth Strategies program are aware of these potential problems. Resolution will come when and if conflicts develop. For instance, it is possible that disputes involving RDC-prepared plans will go automatically to the DCA for mediation.

There is a fundamental assumption inherent in Growth Strategies that all local governments will cooperate and work in good faith to devise plans that can be certified, and then make development decisions consistent with those plans. In a sense, there is the implied threat that if this good faith assumption does not hold, the legislature will give the DCA and perhaps the RDCs special powers to challenge or void actions of local government. Many officials hope that such draconian state involvement in local planning, like that used in Florida and Oregon, will not be needed in Georgia.

Georgia's approach to Growth Strategies is surprisingly similar to North Carolina's approach to coastal planning in the 1970s. In North Carolina, coastal communities were required to prepare plans consistent with regional plans, and regional agencies coordinated local plans. The state planning agency gave oversight to the process, including dispute resolution, technical assistance, and planning funds. The state of Georgia is hoping to apply statewide in the 1990s the approach North Carolina took in planning its coast during the 1970s. Perhaps Georgia can return the favor to North Carolina with the lessons it learns. □

Avery County Growth Management Program: The Evolution of Planning in a Western North Carolina County

David H. Quinn

Avery County, located in the northwestern mountains of North Carolina, has undergone significant changes in land use and economic development over the past twenty-five years. Like many counties in the mountain region, Avery County is stridently independent and has been reluctant to embrace land use planning and regulation. But more recently, attitudes toward managing growth and its impacts on the community have begun to change. This article describes the pilot growth management effort now taking shape in Avery County.

During the 1989 legislative session, the North Carolina General Assembly passed a bill appropriating funds for a planning program in western North Carolina. This bill was introduced by Avery County's legislative delegation, and from the beginning it was understood that the funds were intended for Avery County. The state appropriation represented both the beginning and the culmination of efforts toward a unified approach to growth management in the county.

The growth management concept has been evolving in Avery County for a number of years. In February 1989, a joint resolution supporting a growth management program was signed by the county and its eight municipalities, which are Newland (the county seat), Crossnore, Elk Park, Banner Elk, Sugar Mountain, Grandfather Village, and portions of Seven Devils and Beech Mountain. This resolution, an unprecedented act of cooperation among jurisdictions in the county, developed from several years of discussion. In seeking planning assistance from the General Assembly, the county and several of the municipalities were able to convince the local legislative delegation that their request was unique and that the lessons learned in Avery County might later be transferred to other counties in the region.

The county and the participating municipalities concluded that the North Carolina Division of Community Assistance (DCA) should provide the planning services included in the appropriations bill. DCA has been working with the county and one or more of the eight municipalities since the early 1970s.

Background

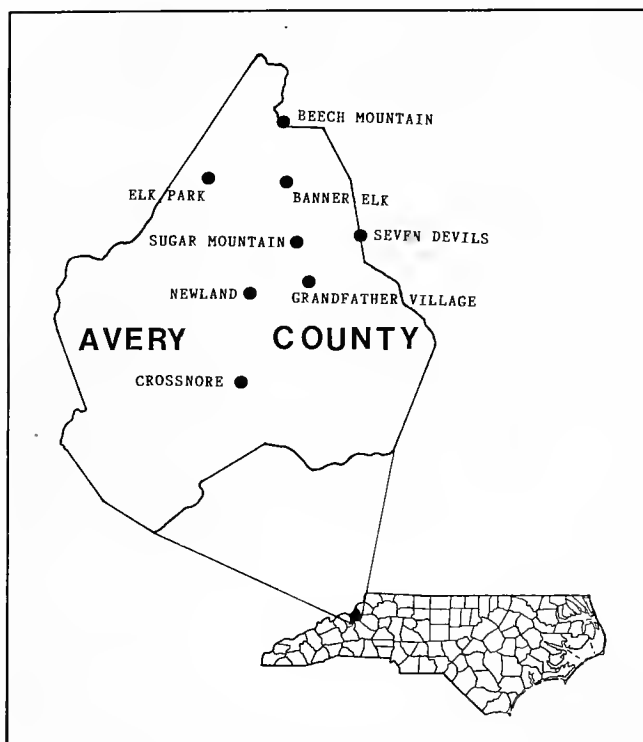
Avery County is resplendent with physical, social, economic, and cultural contrasts. The county is best known for its tourist attractions, which include both golf and ski

resorts, and for its Christmas tree and nursery industry. The diversity that exists between the economic sectors of the county mirrors the diversity that exists among the county's residents.

Most of the larger Christmas tree farms and fields are located along the Toe River in the central and western portions of the county, around the communities of Newland, Crossnore, Altamont, Hughes, and Plumptree (although trees and nursery plants are grown throughout the county). Mike Pitman, agricultural extension agent for the county, estimates that the county's Christmas tree and nursery industry generates annual gross sales exceeding \$25 million. The climate, soil, and elevation in Avery County are ideal for the Fraser fir, considered the superior Christmas tree because of its color, fragrance, and ability to hold its needles after cutting. The Christmas tree and nursery industry has experienced rapid growth in the county since the early 1970s, and Avery County now produces approximately 50 percent of the Fraser fir Christmas trees in the U.S.

The eastern portion of the county is historically tied to resort development. Vast land holdings, including Grandfather Mountain and the Linville Resort community, were assembled by Hugh MacRae, Sr. in the late 19th century.

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During the 1930s, the Blue Ridge Parkway was constructed through the county, and the missing link around Grandfather Mountain was finally completed when the Linn Cove Viaduct opened in 1988.

In the late 1960s and early 1970s, four ski resorts opened in Avery County and adjacent Watauga County. The Beech Mountain, Sugar Mountain, Seven Devils (now Hawksnest), and Appalachian ski facilities created a new resort and tourist market for the winter season, and Avery County rapidly became a multi-season resort area. Another ski development is partially developed on slopes adjacent to the Hawksnest development near the town of Seven Devils.

Over the last twenty years, the original Linville Golf resort and community has been joined by the Grandfather Golf and Country Club resort, the Linville Ridge Golf and Country Club resort on the adjacent ridge between Grandfather Mountain and Sugar Mountain, and the Elk River Golf and Country Club development on the west side of Banner Elk. In addition to these private golf facilities, public courses are located at Sugar Mountain, Beech Mountain, Seven Devils, Land Harbor, and Newland. It is frequently touted that Avery County, with a population of approximately 15,000, has five traffic lights and four of the twelve top-ranked golf courses in North and South Carolina.

While the county's permanent population has grown modestly, second home and seasonal populations affiliated with the summer and winter resorts have increased substantially. In the July 1989 issue of *Snow Country*, a ski industry magazine, an article targeting the fastest growing ski resort counties in the United States ranked Avery in the top eighteen counties for dynamic growth potential. This designation was based upon a survey which used data from 1977 to 1987 and evaluated employment growth, retail sales, total housing units, and jobs in real estate, eating establishments, and hotels/motels.

History of Land Use Planning in Avery County

The area encompassing Linville Resorts, Grandfather Mountain, Linville Ridge, Sugar Mountain, Banner Elk, Elk River Resort, and the Avery County portions of Seven Devils and Beech Mountain, contains approximately 10 percent of the county's land area and over 50 percent of its assessed tax valuation. The concentration of resort developments in the eastern sections of the county has spurred the adoption and enforcement of land use controls in the municipalities of Banner Elk, Beech Mountain, Seven Devils, Sugar Mountain and Grandfather Village. The county government and the municipalities of Newland, Crossnore, and Elk Park, in the less-developed western and central parts of the county, do not exercise any land use controls.

The town of Banner Elk, located on N.C. 184 between Sugar Mountain and Beech Mountain, instituted the first land use controls in Avery County in the early 1970s. Banner Elk's adoption and enforcement of zoning and subdivision regulations within the town and its extraterritorial jurisdiction created a significant "unpleasantness" in



The developer of Linville Ridge golf resort, Raymond Lutgert, used his talent as a sculptor to create a huge golf club head to mark the No. 1 tee.

the community, underscored by at least two lawsuits. The subsequent incorporations of Beech Mountain in 1979, Seven Devils in the early 1980s, Sugar Mountain in 1985, and Grandfather Village in 1987, brought additional land use controls to each jurisdiction.

Completed in the early 1980s, the infamous Sugar Top condominium development, located atop Little Sugar Mountain adjacent to the ski slopes of the Sugar Mountain resort, became the stimulus for the North Carolina ridge law legislation in 1983.¹ In 1983 and 1984, the county commissioners established a planning board and adopted a mountain ridge protection ordinance as an outcome of the Sugar

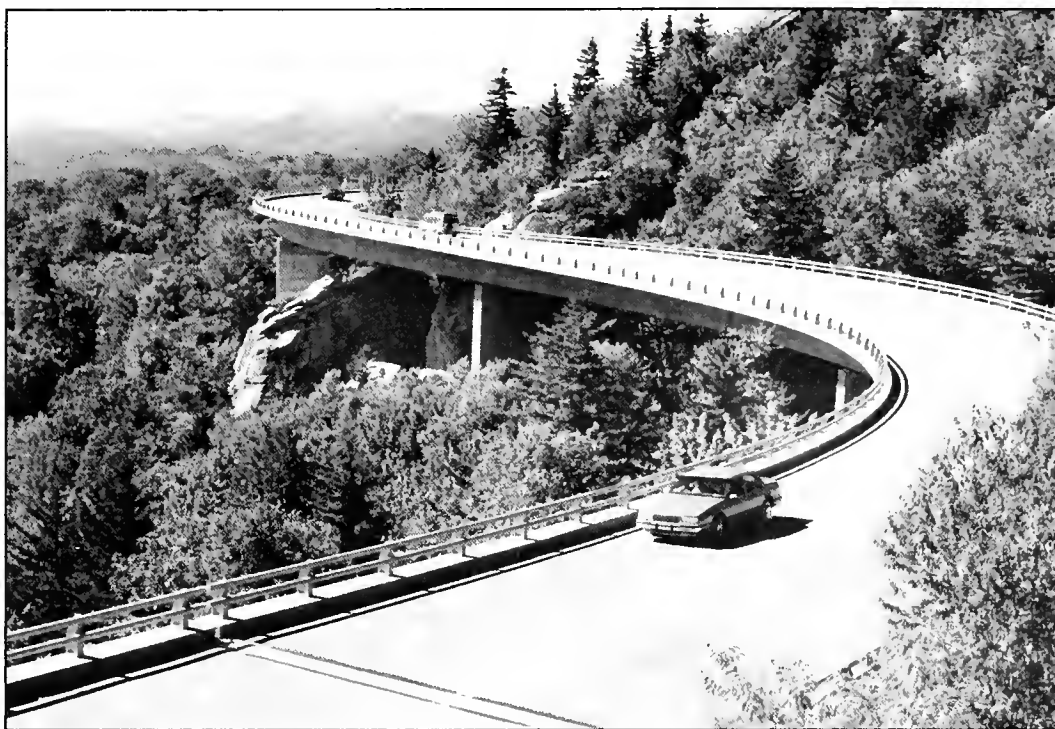
Top development and the ridge law. Attempts to develop a countywide subdivision ordinance and a local soil erosion and sedimentation control ordinance in 1985 were unsuccessful, however, and the county planning board assumed a dormant role and was later abolished.

During 1987 and 1988, elected leaders in the five resort-area municipalities initiated the idea of overlapping their regulatory jurisdictions in order to provide at least some controls over unincorporated areas between their jurisdictions. These five municipalities requested DCA's assistance, since the agency was already working with many of them on separate projects.

The five municipalities met with the local legislative delegation in the fall of 1988. The delegation felt that the rest of the county, especially the county commissioners, should be involved and supportive of the planning effort. The county commissioners were reluctant, however, since they had not been involved previously and since the proposed project was for a small area of the county.

Economic Development Commission: A Strategic Approach

What seemed to be an impasse was overcome when the county commissioners appointed a local economic development commission (EDC) early in 1988. The EDC initiated a strategic planning process for economic development in Avery County in the summer of 1988, and created a number of task forces to study issues identified at an economic summit attended by a broad cross section of



The Linn Cove Viaduct, a portion of the Blue Ridge Parkway built around Grandfather Mountain, has won nine national awards for its beauty and design.

Avery County citizens.

One notable idea generated at the summit was a request that the county commissioners reestablish a county planning board to study land use issues. When the efforts of the five municipalities (now known as the *High Five*) began to wane, the EDC challenged the commissioners to join with the High Five and the other towns in the county to approach the county's planning needs with a united front. Through the work of the EDC and its consultants, members from each of the eight municipalities met with the county commissioners on February 13, 1989, and signed the joint resolution pledging their mutual cooperation to develop and implement a county-wide growth management plan.

Developing a Work Plan

With a unified commitment from the county, the N.C. General Assembly was approached with the request to allocate funds to the Division of Community Assistance (DCA) to develop the county's growth management plan. The unified support from Avery County and the possible transferability of the growth management concepts to other mountain counties captured the interest of the Avery County legislative delegation.

Following legislative approval, DCA assigned a staff person to work with Avery County and its towns and villages on a full-time basis, beginning in September 1989. Meanwhile, the county commissioners, with the support of the EDC and recommendations from the economic summit, reestablished a planning board in April 1989. The

seven-member board, representing diverse county interests, set forth an aggressive two-year work program and adopted the following goals: develop and recommend a local soil erosion and sedimentation control ordinance and enforcement program, a county-wide subdivision ordinance, and a solid waste program. The planning board wanted to move forward on implementation of these elements immediately, rather than wait for the development and adoption of a plan. The consensus was that these items would be recommendations in any growth management plan and were needed as soon as possible.

Once the commissioners had approved the planning board's work program, work was initiated on the local soil erosion and sedimentation control ordinance. In August 1989, DCA began the process of planning a growth management strategy amidst the ongoing planning activities of the county and three of the municipalities. DCA was able to build upon the work of the EDC task forces to identify some specific directions the county wanted to pursue in planning and economic development.

During this period, the Geography and Planning Department at Appalachian State University (ASU) became involved with the project, through an approach made by Professor Garry Cooper. This arrangement gave Avery County and DCA access to the resources of the Geography and Planning Department, including its geographic information systems (GIS) and its staff expertise on data collection and environmental issues. In March 1990, DCA hired an additional staff person, Joe Rubisch, whose background in computer mapping and interpretation provided technical skills needed to work with ASU and to interface their GIS system with the physical planning requirements of the project.

In addition, ASU acquired a Z. Smith Reynolds grant, and the Avery County commissioners funded a graduate assistantship to supplement the joint effort. Much of the environmental and physical data for the county will be compiled and mapped by ASU. DCA will have the primary responsibility for plan development and implementation strategies.

Environmental Concerns

There are obvious and predictable environmental issues in the mountain region which DCA staff members are attempting to address in Avery County. These issues, including slope, soils, and flood prone areas, will be developed

and mapped in conjunction with ASU. The affiliation with ASU will enable DCA staff to evaluate more physical and environmental information than would otherwise have been possible. DCA staff will also attempt to evaluate the constraints on development in other sensitive environmental areas, including those with upland wetlands and endangered flora and fauna.

One long-standing environmental concern in Avery County has been the damage to streams and rivers caused by sedimentation. Both long-time residents and newcomers have become aware of the reduction or total loss of native trout populations in many rivers and streams. County Commissioner Fred Banner and planning board member Clay Houston have taken DCA staff to streams and rivers that have been severely damaged, if not completely destroyed, for trout habitat. Most damage can be traced to developments, both large and small, that have caused siltation which trout populations cannot tolerate.

The high priority and the early passage of the county's more restrictive soil erosion and sedimentation control ordinance demonstrates the community's concern for environmental protection.

Just as the Sugar Top project triggered the ridge law legislation restricting ridge top development, the loss of numerous trout streams has produced a regulatory reaction to sedimentation damage.

Avery County citizens, through the EDC task force groups, have identified two other specific environmental concerns. The tree and nursery industry uses herbicides and insecticides to reduce competitive growth and destructive insects. Citizens have expressed concern regarding the potential impact of



The Sugar Top condominium development.

certain widely-used chemicals on the water table and surface waters. No evidence or documentation has been found to substantiate the concern. Nevertheless, the expanding tree industry, which relies on chemicals for the production and protection of crops, will need to be monitored to insure the maintenance of safe drinking water and healthy streams.

Although beyond the scope and regulatory capacity of the county, the severe and growing impact of acid rain is another concern in Avery County and other areas of western North Carolina. Hugh Morton, owner of Grandfather Mountain, is leading regional and state efforts to draw national attention to the acid rain damage occurring in the state's higher elevations, most notably at locations above 5,000 feet. Acid rain is killing red spruce and Fraser fir trees and severely affecting other species of vegetation and trout streams. Measurements taken by researchers at Mount Mitchell and other sites indicate that acidity levels of rain



This Christmas tree farm is near Linville Falls at approximately 3500 feet in elevation. Dr. James Shelton of N.C. State University, principal advisor to the Christmas tree growers in Avery County, says that farms he has tested at 2000 to 4000 feet in elevation are receiving between 40 and 60 pounds per acre of air pollution sulfates per year, while they naturally can accommodate 18 pounds per acre per year.

and rime ice are at least equivalent to that of lemon juice. The potential damage to the tree and nursery industry and the tourist industry is a significant environmental and economic concern, even though it transcends the regulatory powers of the county and state.

It is apparent that environmental issues are a significant basis for planning in Avery County and the mountain region. The carrying capacity and the sensitivity of the mountainous terrain dictates that regulatory measures more stringent than those in the less sensitive areas of the Piedmont are needed. Protection of the environmental and aesthetic qualities of Avery County is paramount for preserving the county's economic well-being and the quality of life of its residents and visitors.

Accomplishments

As of October 1, 1990, the county has adopted a local soil erosion and sedimentation control ordinance, which regulates land disturbing activities on sites greater than 20,000 square feet. The county is in the process of hiring an ordinance administrator to enforce the erosion ordinance, flood ordinance, ridge law ordinance, and proposed subdivision regulations. The planning board has completed a draft of a countywide subdivision ordinance and has forwarded it to area agencies and individuals for review and comment. The planning board wants to have a recommended ordinance to the commissioners by February or March 1991.

The development of the growth management plan has not proceeded as fast as DCA staff had hoped. However,

the planning board and county commissioners' desire and willingness to move forward with implementation has been welcomed and represents a marked record of success to date. DCA's involvement with ASU will provide the county with more detailed physical and environmental data in a GIS format, and DCA staff are optimistic that the work with ASU will provide a transferable data collection model that can be used in other communities in western North Carolina.

Although the specific time frame for the project is two years, some elements will take longer. The growth management plan will have to be pushed forward into 1992, as work on the soil erosion and sedimentation ordinance and the subdivision regulations has consumed a significant amount of time during the first eighteen months. DCA's schedule with ASU has been adjusted to coincide with the availability of staff and students.

The long-term success of the pilot growth management project in Avery County will depend on several factors. It is hoped that the foundations for planning will be firmly established and staff hired to implement the plans and policies in the county. These foundations include a reasonable, pragmatic plan which identifies both constraints and opportunities for growth, environmental considerations, and the practical means of converting the identified constraints to and opportunities for growth into policies and regulations that can be adopted and administered within the existing political framework of the county and its municipalities.

The continuing challenge will be to work with the diverse needs and developmental character of the various sections and interests of the county. Recognition of this diversity and the development of strategies that are appropriate and timely will dictate any measure of success. The technical quality of the plan and its recommended policies and regulations can be deemed successful only if they are accepted and used by the community and its constituent parts. The maxim of the growth management effort in Avery County: *Tread the planning path with practical feet.* □

Notes

1. The Mountain Ridge Protection Act of 1983 (N.C. General Statutes 113A-205 to 113A-214) regulates construction of buildings taller than 40 feet on ridges of mountains whose elevation is 3000 feet above sea level and whose elevation is 500 feet or more above an adjacent valley floor. The law, in effect in 25 mountain counties of North Carolina, is based on the harm such structures cause to the natural beauty of the mountains and the difficulty of supplying water and sewer services at such heights.

Balancing Environmental Protection and Economic Development: What Do North Carolinians Want?

Frank K. Brown

The latter part of the 1980s saw a revival of concern about environmental issues. These issues began to occupy more of policy makers' time and attention at both the national and local levels. Little has been done to evaluate public opinion about the difficult choices between the environment and growth and development, however.

In October 1989, MarketSearch Corporation of Columbia, S.C., conducted a telephone survey of 1500 residents of North and South Carolina, 750 from each state, on economic development and the environment. The purpose of the study was to evaluate public opinions and attitudes about these two important areas and how people in the two Carolinas feel about them. This report focuses on the viewpoints of North Carolinians by highlighting some of the study's key findings.

Support for economic growth and development is strong in North Carolina. In fact, almost three-fourths (73.5%) of its residents surveyed feel their communities should be doing more to attract new business and industry to the state. This support for growth remains strong even when the environment is taken into account.

"Despite some of the environmental problems caused by growth, North Carolina should continue to encourage growth and development for the benefits it brings to the people in an area."

<i>Disagree Strongly</i>	<i>Disagree Moderately</i>	<i>Don't Know</i>	<i>Agree Moderately</i>	<i>Agree Strongly</i>
6%	8%	4%	39%	43%

Strong support for growth and development, however, does not mean a lack of concern for the environment. North Carolinian's support for preserving the environment is at least as strong as their support for growth. Four-fifths, for example, agree that the environment must be protected, regardless of cost.

"Protecting the environment is so important that standards cannot be too high and improvements must be made, regardless of cost."

<i>Disagree Strongly</i>	<i>Disagree Moderately</i>	<i>Don't Know</i>	<i>Agree Moderately</i>	<i>Agree Strongly</i>
5%	10%	4%	36%	45%

Virtually all North Carolinians (95%) say they are more concerned about the environment than they used to be. When asked about their expectations for the future, an optimistic one-third expect the environment to improve but an equal number expect the environment will get worse

over the next five years. Nevertheless, a strong majority (70%) feel that impact on the environment is inevitable and are willing to live with some impact as long as things are kept in balance.

"Any kind of business or industry has some kind of impact on the environment. I am willing to live with some damage to the environment as long as we keep things in balance."

<i>Disagree Strongly</i>	<i>Disagree Moderately</i>	<i>Don't Know</i>	<i>Agree Moderately</i>	<i>Agree Strongly</i>
13%	13%	4%	42%	28%

Businesses are viewed as generally concerned by North Carolinians. In fact, over three-fourths of them (78%) agree that businesses in their community show concern for the environment and do their best to keep environmental damage to a minimum. This does not mean, however, that any kind of growth and development is accepted. For instance, while businesses such as recycling centers and electronics manufacturers receive high acceptance ratings (four-fifths favor their nearby siting), nuclear power plants and toxic waste sites are least popular, with less than 25 percent wanting them to locate in their community.

Although North Carolinians feel that businesses are concerned, only one in eight feel that businesses could do the most to solve environmental problems. Over half look to the government for solutions, with one-third pointing to state and local governments, and one-fifth to the federal government. Close to one-third believe that the solutions can best be attained by American consumers themselves.

"Which of the following groups would you say could do the most to help solve environmental problems?"

<i>State/Local Governments</i>	<i>American Consumers</i>	<i>Federal Government</i>	<i>American Businesses</i>	<i>Don't Know</i>
32%	29%	21%	12%	6%

As time passes, the public will be called on to make a series of difficult choices based on the growing amounts of information that are available on these issues. The challenge to planners and decisionmakers in the years ahead will be to translate the public's desire for a balanced approach into workable plans of action for the benefit of all.

Frank K. Brown, founder of MarketSearch Corporation in Columbia, S.C., has been involved in market and consumer behavior research for more than twenty years. He has a Ph.D. from the University of North Carolina at Chapel Hill, and has served on the faculty at both Emory University and the University of South Carolina.

Pre-Storm Mitigation and Post-Storm Reconstruction: A Plan for Nags Head

Bruce M. Bortz

For innovative planning efforts in the field of hurricane and storm mitigation, the town of Nags Head won the 1990 Legislative Award from the National Hurricane Conference, and the 1989 Small Community Outstanding Planning Award from the North Carolina chapter of the American Planning Association. The Federal Emergency Management Agency (FEMA) is developing a Hazard Mitigation Handbook using components of the Nags Head Storm Hazard Mitigation and Reconstruction Plan. In January 1990, Dr. Bortz presented the Nags Head plan at the Eighth Annual Winter Conference of the South Carolina Sea Grant Consortium, held in Columbia, South Carolina.

Introduction

In the mid-1970s elected officials and citizens of Nags Head, North Carolina began to fully appreciate the uniqueness of the low-density development of their community. They noticed the building trends of Ocean City, Maryland and Myrtle Beach, South Carolina, among other shoreline municipalities, which feature high-intensity beach development characterized by arcades, amusement parks and golf courses. The people of Nags Head began to fear that if future land development in their community were not regulated, then the quality of living in Nags Head would be lost. These important qualities include the slow pace of life, freedom from pollution and pressures from urban populations, and preservation of the natural environment and recreational opportunities. These qualities have been termed "the family beach atmosphere."

In 1980, the town's primary development goal was preservation of this family beach atmosphere--preservation of those qualities which had first drawn visitors and permanent residents to Nags Head. At the same time, the town realized that development after a hurricane or severe coastal storm would forever alter this environment. Open spaces and the ocean beach would be lost to redevelopment, forested areas could be destroyed, high densities and high rise development could occur and the family beach atmosphere would be lost forever.

For the last ten years the town has been working on numerous mitigation measures to reduce the loss of life and property associated with damaging coastal storms and hurricanes. Nags Head's approach to pre-storm mitigation measures has been far-reaching, from policy decisions on rebuilding of roads to restrictive oceanfront zoning, along with emergency police powers delegated to the town mayor in times of emergency.

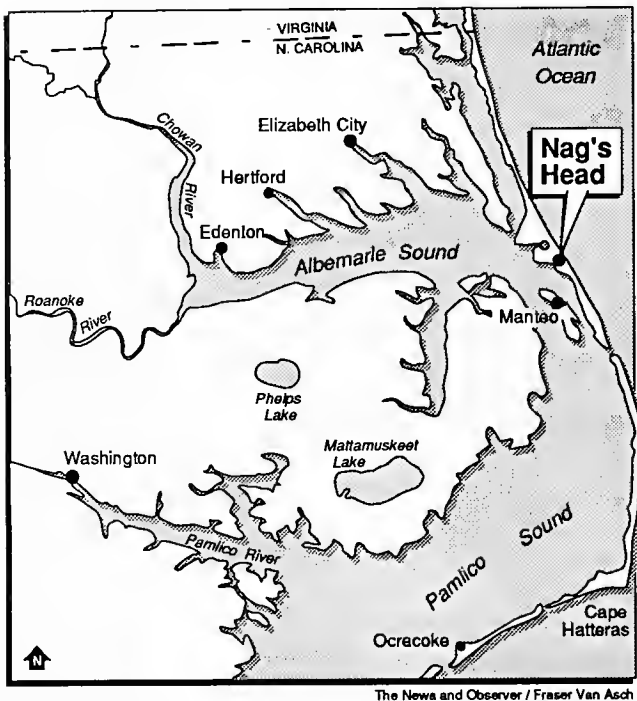
For the successful adoption of this plan it was necessary

for the planning staff to develop a close working relationship with the various town boards. One of the primary goals of the planning staff was to keep the elected board informed and involved with the development of this plan. For every mitigation measure considered, the staff would provide background material for the proposed regulation and tools for implementation, along with alternative consequences if this mitigation measure were not adopted. Keeping the elected board and other town boards well informed and involved on the issues, both pro and con, greatly reduced any apprehensions for adoption of pre-storm and post-storm mitigation measures.

In developing specific standards and regulations for the Nags Head Hurricane and Storm Mitigation and Reconstruction Plan, the planning board and the elected board addressed several fundamental issues: Is the proposed standard necessary to protect the health, safety and welfare of citizens and visitors in Nags Head? Is this proposed standard in compliance with the town's land use plan? Would the adoption of this regulation reduce the "level of risk" for individuals and property? Have alternative standards or mitigation solutions been addressed?

Throughout the development of this plan, the planning and development staff stressed to the town's elected board the importance that any effective mitigation program adopted by the town must be founded with a full understanding of the natural dynamics of the coastal environment. Those forces which alter the coastal environment include waves,

Bruce M. Bortz is the town planner for the town of Nags Head, North Carolina. He received his Ph.D from the College of Fisheries of the University of Washington, Seattle, Washington. During the past five years, Dr. Bortz has made numerous presentations and authored several papers on hurricane mitigation and recovery.



wind, barrier island migration, and dune and beach dynamics.

The plan will cover three major components of hurricane and storm mitigation, involving actions the town takes before a storm or hurricane, during the storm event, and post-hurricane or storm mitigation and reconstruction actions.

Pre-Storm Mitigation Measures

Pre-storm mitigation measures are designed to lessen the loss of life and property that is subjected to risk. Measures the town has taken over the last ten years to reduce potential risks and maintain the open space along the oceanfront include prohibiting all commercial activities on the ocean beaches, closing the ocean beaches to swimming and surfing when storm conditions appear, and a strong active program for beach access improvements and open space acquisition.

Strict land use and zoning regulations enacted by the town in the last ten years have strengthened pre-storm mitigation measures. Highlights of these regulations include the following:

- Even though all coastal communities in North Carolina are required to follow oceanfront use and setback standards of the North Carolina Coastal Area Management Act (CAMA), the town has adopted some standards which are more restrictive.
- Town regulations impose strict setback, height and open space requirements for oceanfront motels and condominiums.
- The potential number of allowed hotel units per acre on the oceanfront was reduced by 60 percent.

- The potential number of allowed multi-family units on the oceanfront was decreased by 73 percent.
- The town prohibits wood frame, multi-story, multi-family buildings on the oceanfront to reduce the threat of fire.
- Commercial businesses are allowed only in a relatively small zoning district fronting the ocean and these commercial activities are limited to fishing piers, motels and restaurants.
- The site review process encourages development to locate as far as possible away from the ocean.
- All new subdivision lots on the oceanfront must extend from the Atlantic Ocean to the nearest state road that parallels the ocean. This eliminates cul-de-sac lots and flag lots, thus affording the opportunity for houses to relocate landward as erosion continues.
- Large lot sizes are required for single family and duplex structures on the oceanfront.
- Prior to rebuilding, the town may require that adjoining lots in common ownership be combined into one large lot.
- In addition to adopting FEMA flood prevention standards, the town has adopted some standards which are even more restrictive than FEMA.
- The town strictly limits the amount of impervious surfaces within the oceanfront zoning districts, thus reducing the amount of real property at risk.
- The town has extended its extra-territorial jurisdiction to one mile out in the Atlantic Ocean and the Roanoke Sound to regulate any activities that may occur in these areas.

In conformance with FEMA requirements, town building inspectors annually assemble and train assessment teams to survey damage after a storm. A Reconstruction Task Force of thirteen government officials and citizens receive annual instruction to prepare for their advisory role to the board of commissioners on a wide range of safety, zoning and reconstruction issues. Through newspapers, a quarterly newsletter and the local cable access channel, the town educates citizens regarding storms, hurricanes and rip tides.

Although the actual storm event is short-lived, the town is prepared thereafter with specific powers delegated to the mayor for declaring curfews, moratoriums, restrictions on travel and the operation of businesses. A building moratorium is automatically in effect should a hurricane strike the town. The town mobilizes and centralizes its response forces composed of fire, police, public streets and water departments, along with building inspectors.

Post-Storm Mitigation and Reconstruction

The town of Nags Head in October 1988 adopted a unique and resourceful program to mitigate the potential



Severe erosion has left this oceanfront house, once situated on high ground, at the edge of the Atlantic Ocean.

for the loss of life and property associated with hurricanes and natural disasters. The actions the town has taken will not only reduce numbers of individuals at risk should a disaster occur, but also will assure that the town will be rebuilt in a safe manner. These actions are rather unique and innovative in that Nags Head is ensuring public safety, protecting lives and property, and preserving the natural, cultural and economic resources through a program of land use controls and regulations. For this program the town of Nags Head received the 1989 Small Community Outstanding Planning Award from the North Carolina chapter of the American Planning Association.

This post-storm hurricane and storm mitigation and reconstruction program is a unique blend of planning management tools, town ordinances and policies, interagency cooperative agreements, as well as specific police powers given to the mayor. The purpose of the program is three-fold. First, the town is preparing now

for a major natural disaster. Second, the town has adopted laws which will provide for an orderly response in the event of a disaster. Third, the town has approved planning management tools which will reduce the numbers of people and value of property at risk after a storm while protecting and enhancing the economic stability of the town and protecting its most valuable resource--the ocean beach.

The components of the post-storm hurricane reconstruction plan consist of a wide range of unique and resourceful regulations and policies designed to increase public safety and to guide the town and its residents step-by-step from the damaging storm event through the determination of damage and the issuance of building permits. The plan will ensure that the town is rebuilt in a planned, safe, and economical manner.

The plan also will assure that all rebuilding will be in accordance with state and local laws and regulations.

Highlights of the hurricane and storm reconstruction plan include the establishment of building moratoriums based upon the severity of damage to ensure that structures are not rebuilt and occupied prior to passing safety inspections. Health and welfare requirements are instituted for



Sand bags buy time for these oceanfront houses.

the issuance of building permits to repair storm-damaged structures. Conditions are defined for declaring hazardous and damaged buildings and structures in public trust areas as public nuisances.

The plan has established policies for the reconstruction of private and public roads in addition to a program for rapid acquisition of land for open space, parks, recreation areas, and historic or scenic areas.

The plan establishes a program in which the town will utilize an assistance facilitator-consultant to advise the town and its citizens of types of emergency assistance and post-storm aid which are available, and will assist the town and its citizens in securing aid in those programs most needed.

The plan highlights the mayor's special authority when an emergency threatens the lives, safety, health and welfare of the town's citizens. The mayor may declare a state of emergency establishing curfews and restrictions on possession, consumption or transfer of intoxicating liquor, place restrictions on the possession, transportation and transfer of dangerous weapons, restrictions on access to damaged areas of the town, and may authorize emergency evacuation of the area.

In hurricane and storm preparedness and mitigation, risk has two primary elements: the exposure of people and property to coastal storms; and the potential for injury, loss

of life, and damage to property. The town addressed the probability of a severe storm occurring and then determined what mitigation measures were appropriate to re-

duce the risk to life and property. The adopted program represents a balance between actual and potential risks and the social benefits and detriments associated with the re-

strictions a town can impose on its citizens.

Nags Head has developed as a low-density town rather than a high-density, high-rise oceanfront community due to the town's commitment to preserving the family beach atmosphere. Pressures from the development community have since decreased, giving the town an advantage in the adoption and implementation of pre-storm mitigation and post-storm reconstruction measures.

An important feature of this mitigation and reconstruction program is that it was prepared and adopted by the governing board prior to a severe storm. This prior adoption not only leads to objective decision-making, but also lessens the social, political and economic pressures on the town which typically surface after a severe storm.

Conclusion

Implementation of this program will meet the town's goals of reducing in advance the potential for loss of life and damage to property from hurricanes and severe coastal storms, and establishing procedures, policies and mitigation measures during reconstruction to reduce damage from future storms.

Although the plan was designed for Nags Head, it would be applicable to many coastal communities and certain components of the plan would be beneficial for any community recovering from a natural disaster. The plan has been requested from localities as far away as California. The neighboring Outer Banks towns of Kill Devil Hills, Kitty Hawk, and Southern Shores have either incorporated some of this plan in their ordinances or are considering the issue now. The Federal Emergency Management Agency is developing a Hazard Mitigation Handbook which will contain components of the Nags Head plan. □

"An important feature of this mitigation and reconstruction program is that it was prepared and adopted by the governing board prior to a severe storm."



Once on the oceanfront and in danger of destruction, this relocated house now sits a comfortable 1,000 feet from the ocean.

Articles

Watershed Protection: Problems and Possibilities

Judith Welch Wegner

For various reasons, including heightened development pressures, health concerns, and new federal and state regulations, many local governments are for the first time taking steps to protect their water supply. These steps usually include regulation of land use in the water supply watershed, and this regulation often crosses jurisdictional boundaries. This article describes the steps taken by representatives of Carrboro, Chapel Hill, and Orange County (N.C.) to improve the regulatory scheme governing the University Lake watershed. The article identifies four major problems encountered in this process, and provides valuable insights for jurisdictions facing similar challenges.

Watershed protection has become a matter of increasing concern to planners and elected officials in North Carolina and elsewhere. In recent years, existing water supplies have proved inadequate to serve public needs resulting from increased use of water and population growth. Even where existing supplies provide a sufficient volume of water, more intensive development nearby may lead to degradation of water quality. New reservoir sites have become more and more difficult to identify, as undeveloped sites convenient to high-quality water supplies and user populations become increasingly scarce. Scientific studies have demonstrated previously unknown health risks associated with levels of pollutant loading that may have been accepted without comment in the past, and federal regulation of the quality of drinking water supplies has become more comprehensive and more stringent.

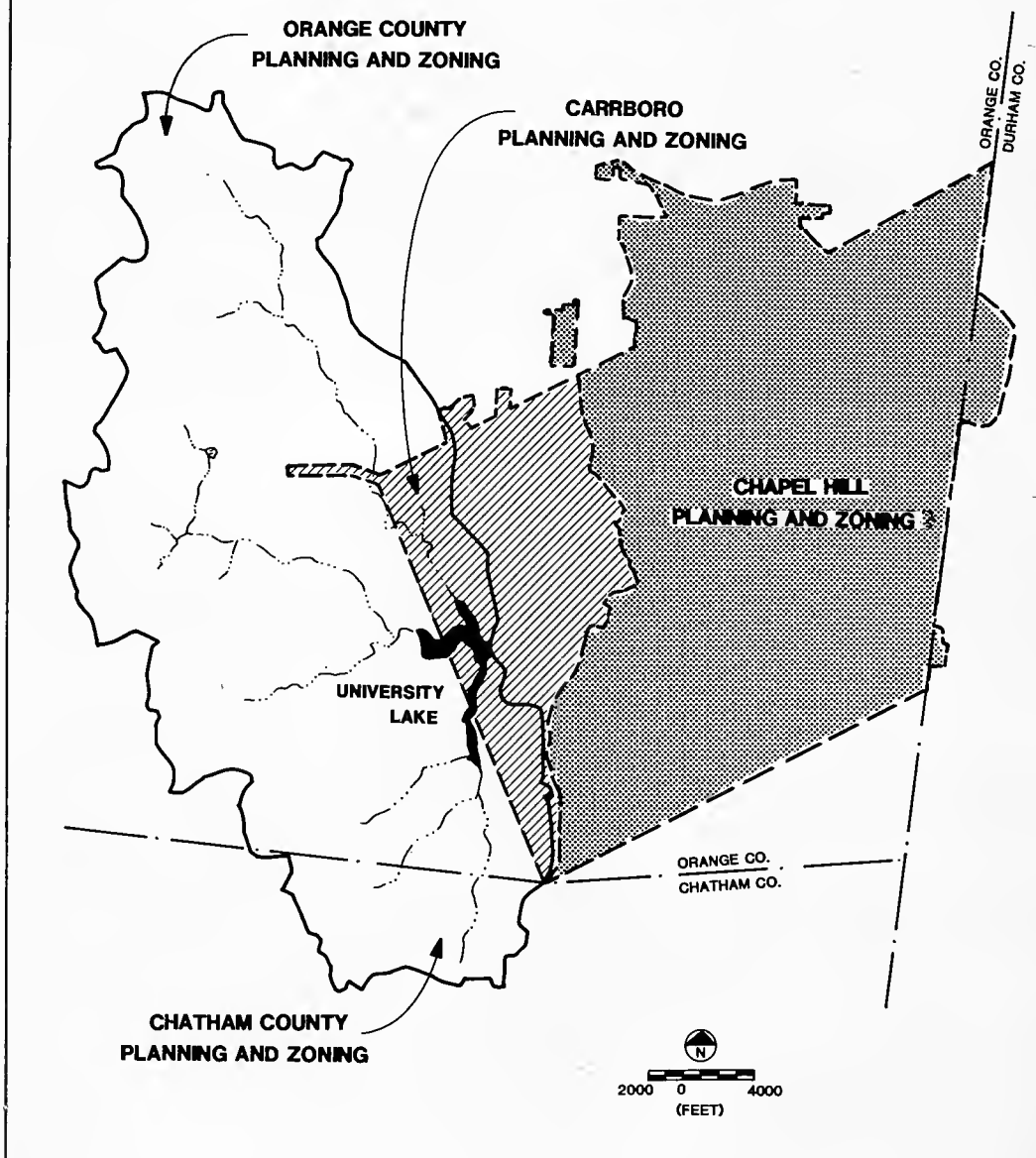
North Carolina has also adopted more demanding requirements for water supply watershed protection, through the enactment in 1989 of House Bill 156 (G.S. 143-214.5), and adoption of accompanying regulations in December 1990. This legislation provides for a cooperative program of watershed management and protection to be administered by local governments consistent with minimum statewide management requirements. The state will continue to play a role in adopting rules for classification of water supply watersheds and protection of surface water supplies through minimum performance-based water supply watershed management requirements, but will have an enhanced role in administering and enforcing minimum statewide requirements if local governments fail to adopt a water supply watershed protection program or fail to carry out their enforcement responsibilities. Local governments must develop ordinances which comply with minimum state requirements and address land use activities, best management practices, development density controls, and

structural stormwater controls, and submit such ordinances for review at the state level. If local governments fail to adopt programs that meet state requirements or fail to adequately administer and enforce the provisions of their programs, the state Environmental Management Commission may assume responsibility for water supply watershed protection.

As local governments, planners, elected officials, advisers to development interests, and members of the public prepare to meet the significant challenges posed by these recent developments, it is important to take stock of the problems likely to be confronted in the course of efforts to improve the protection afforded water supply watersheds, and to think creatively about possible solutions to those problems. This essay endeavors to do just that, drawing on the author's recent experience as a member of the Carrboro, North Carolina Board of Aldermen during a time in which representatives of Carrboro, Orange County and Chapel Hill sought to improve the regulatory scheme governing the University Lake watershed (which supplies drinking water to area residents) and her background as a teacher of local government and land use law. The essay first provides background about the University Lake watershed. It then analyzes four major problems encountered in the course of efforts to develop an appropriate regulatory scheme, and discusses the policy development process and possible solutions to those problems identified in connection with the University Lake experience. The essay concludes with suggestions for decisionmakers in other jurisdictions that may soon face similar challenges.

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**FIGURE 1. LOCAL GOVERNMENT JURISDICTIONS
IN THE UNIVERSITY LAKE WATERSHED**



The University Lake Watershed

The University Lake watershed is located in Orange and Chatham Counties. It is approximately 30 square miles in size. More than 95 percent of the watershed is privately owned. The watershed lies in three different political jurisdictions, with roughly 80 percent of the land falling under the authority of Carrboro, and 10 percent under the authority of Chatham County (see Figure 1).

The University Lake reservoir was built in 1932. The reservoir is a major component of the water supply system that provides water for Chapel Hill, Carrboro, and parts of Orange County. The reservoir is managed by the Orange

Water and Sewer Authority (OWASA), an independent authority governed by a nine-member board (five members appointed by Chapel Hill and two each by Carrboro and Orange County). OWASA provides water supply and wastewater services to approximately 60,000 residents of Carrboro, Chapel Hill, and Orange County. Fewer than 10 percent of the University Lake watershed's residents are consumers of University Lake water, however, and the nearly 1,850 households located in the University Lake watershed rely primarily on private wells and septic systems.

Questions concerning the adequacy of the area's water supply had been raised for a number of years as a result of increased water consumption, population growth, and summer drought conditions. OWASA began steps to develop an additional reservoir to supply necessary water. After a good deal of debate and litigation, construction began on the Cane Creek reservoir. This reservoir eventually came on line in 1988, increasing OWASA's raw water supply to 13.5 million gallons per day.

In the meantime, University Lake reservoir came under increasing pressure. In

the early part of the decade, Orange County and Carrboro had implemented land use restrictions designed to protect the quality of the reservoir's water, by identifying a critical area near the lake, and imposing density restrictions (one and two acre lot sizes) and impervious surface limitations. By 1985 and 1986, however, development pressures had escalated, particularly with regard to land just to the west of Carrboro. Two significant residential subdivisions were proposed (one, Laurel Springs, was located in Orange County's jurisdiction, and the other, Amberly, in an area adjacent to Carrboro where annexation was requested). The Amberly project proved to be particularly controversial not only among Carrboro residents but also among

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residents and elected officials of Chapel Hill and Orange County, due to its large size (215 acres and 177 units) and proposed reliance on public water and sewer services (which, if made available, would have to be authorized by OWASA). The debate over the Amberly project ultimately set the stage for more extensive discussion of water supply watershed management strategies, and led to the adoption of new land use regulations by Carrboro and Orange County in 1990 as well as related modification of OWASA policies during the same period.

Problems and Pitfalls in Developing Regulatory Strategies

Planners and elected officials faced with a scenario such as that just described might well identify a number of concrete policy issues or considerations that should be considered in developing watershed management strategies. Soil and topographic conditions, hydrological data regarding water quality degradation and the impact of water quality on health and safety, population trends and economic projections, legal requirements and procedural prerequisites must all be taken into account. Certain other institutional problems and pitfalls may also have a dramatic effect on the ability of local governments to develop effective watershed management strategies. These institutional problems and pitfalls deserve special attention here because they may be encountered by many jurisdictions for the first time while preparing new watershed management policies.

1. Difficulty in Defining the Problem. Development of government policies in a wide variety of areas may require a careful diagnosis of surprisingly complex problems and an extensive search for suitable responses. For example, local governments' responses to the need for more affordable housing, a revitalized downtown, or improved relations between the police force and the community may require thoughtful examination and understanding of a variety of viewpoints and the creation of multi-faceted solutions. Perhaps more than in these other settings, however, there may be significant difficulties in defining the problem of watershed protection and watershed management, as well as in diagnosing the problem and finding suitable solutions.

Watershed management problems tend to exist at a variety of different levels simultaneously. A given jurisdiction may face a very concrete question whether to approve a conditional use permit or rezoning request for a particular development project. That jurisdiction may therefore

define the problem as one of reaching an appropriate resolution with regard to the given project within the context of existing regulations. At the same time, how-

ever, the project may stimulate questions regarding the adequacy of the jurisdiction's existing regulatory scheme for protecting water quality within the specific watershed in question; the adequacy of its overall regulatory scheme for other watersheds within its control; the relation between regulatory goals such as the protection of water quality and the promotion of affordable housing or farmland preservation; its obligations to protect the quality of water supplies that may serve other jurisdictions; and the adequacy of the regulatory schemes in effect in other jurisdictions that lie within the same or nearby watersheds.

Different participants in discussions concerning the development of an appropriate watershed management strategy may favor different definitions of the problem at hand for a variety of reasons. For example, it may well be argued that for reasons of fairness, existing regulations should be applied to resolving a pending permit or rezoning request. At the same time, it may be contended that a particular development proposal raises more fundamental questions that must be addressed on one of the larger scales just described. Yet again, definition of the problem on an area-wide scale at the outset may well mean that a prompt resolution of the debate on possible solutions proves impossible, in light of the difficult coordination problems raised and the increased potential for impasse.

Which definition of the problem is the correct one--one of those just sketched, or others that might be imagined? One of the most difficult aspects of resolving such a debate over the definition of the problem of watershed management is that each of the arguments advanced above has merit; each of these viewpoints is correct. If it is possible to proceed from this premise, rather than the premise that one or another viewpoint is correct and others are incorrect, a coordinated response to watershed management on a variety of levels may ultimately be achieved. If, instead, the debate stalls over which viewpoint is the correct one, the confusion may be compounded and little progress made toward common goals.

2. Problems in Developing an Adequate Information Base. As noted above, planners and elected officials generally recognize the need to develop an appropriate information base before reaching important public policy decisions. There are, however, special pitfalls in reaching this objective in connection with the development of watershed management policies.

There are at least three dimensions to the information base that is needed in reaching sound watershed management decisions. Information is needed concerning factors generally considered in the development of land use policies; those that relate to environmental health and science and more technical engineering issues; and those that relate to balancing the concerns of different segments of the community (often described as "political" in character). In a particular jurisdiction, information may be unavailable relating to one or another of these dimensions, or, if available, may not be shared by all those involved in development of watershed management policies. Conflicts can therefore arise unless a more adequate, shared information base is developed.

Traditionally, local jurisdictions have staff with expertise in land use planning, often derived through a combination of formal education and practical experience. Such individuals may be skilled in addressing the problems of urban and suburban populations, or (in jurisdictions with less developed land) in responding to the difficulties faced by more rural populations; however, they frequently do not have experience in both areas. Moreover, planners who have been on staff for quite some time may lack insight into or confidence in newer strategies for land use management within transitional or environmentally sensitive areas, may lack training in communications and dispute resolution skills that are helpful in dealing with diverse populations, or may have developed relatively inflexible judgments concerning the importance of competing policy considerations as they affect a given community or group of communities. Finally, due to continuing financial stringencies throughout the public sector, planning departments may be understaffed or may experience repeated turnover of personnel, making it difficult to allocate staff time toward development of a comprehensive information base regarding watershed management, in light of the press of urgent business in other areas.

Depending on the jurisdiction, more or less technical information regarding health and safety and engineering issues related to water quality may be available. Limitations on staff background and experience such as those outlined above may also exist with regard to those staff members responsible for managing an area's water supply, particularly if such staff have limited training and responsibility for land use planning issues, just as planning staffs often lack training and expertise regarding engineering issues. While additional expertise may be available through

contact with regional councils of government or separate water and sewer authorities in an area, or through contracts or consulting relations with trained engineers, con-

tact between government staffs and elected officials, and others with specialized expertise may be infrequent and may not be enough to develop a strong and lasting information base.

In addition, it

must be borne in mind that efforts to protect drinking water watersheds continue to require analysis and information-gathering at the cutting edge of environmental science and engineering. As scientific studies continue to be undertaken, understanding of the relationship between water quality and nearby development is likely to increase. Nonetheless, reliance on projections and computer modeling will continue to be required in order to identify the potential for future problems and to head them off before they arise. Analysis must also take into account the significant differences between individual watersheds, including those that arise because of variations in soil types, topography, reservoir characteristics, tributary systems, meteorological conditions, existing patterns of development, and other significant variables. In addition, it is important to recognize that technically sophisticated analysis and information of this type often may not be easily digested by all members of the community (whether they are elected officials or citizens), in light of the unfamiliar terminology and concepts typically used to communicate relevant findings.

Finally, information is needed concerning the political realities at work in given jurisdictions. At the outset, it is important to recognize that "politics" is not a dirty word; it is all too easy to describe the view of one segment of the community as "political" while treating that of another segment as legitimate and sacrosanct. An assessment of political realities can and should represent a careful evaluation of the viewpoints of differing segments of the community, and the bases for those views--whether they are economic, historical, or psychological. Moreover, it is important to recognize that economic, historical, and psychological considerations are likely to operate with regard to each segment of the community, not just some.

For example, urban or suburban water users who do not live within a regulated watershed may strongly favor stringent watershed regulation for reasons quite apart from health and safety considerations: they often would prefer not to pay the cost of purchasing additional land for the purpose of protecting an existing or future reservoir; they

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may traditionally have looked down on more rural residents as less educated or politically powerful; and they may be both more aware or more fearful of potential health risks, less used to accepting unwellcome change within their environment without protest, and more inclined to retain the size and character of the community as it exists rather than allow-

ing an additional influx of population that may arise if stringent land use controls are not imposed. On the other hand, more rural residents who live in water supply watersheds may reasonably fear that stringent regulations will result in decreased land values (foreclosing an opportunity for needed agricultural financing or retirement support); believe that watershed regulation efforts represent just one more in a series of efforts by suburban political powers to impose burdens without providing offsetting benefits; and conclude that their ability to control their own destinies and to manage property long held in their families is threatened without adequate reason by those who have not had to exercise careful stewardship of the land. These political realities may not be understood by all elected officials or government staff. If they are ignored or lightly dismissed, without being understood as part of a shared information base, irreparable controversy and unsound policy judgments are likely to result.

3. Inadequacy of Traditional Decision-Making Processes.

The procedural and substantive requirements that govern adoption of regulations and related decisions by local governments are generally well known and reasonably well understood by planners and local government officials. Local governments must have adequate authority to undertake various sorts of initiatives, and they must operate within statutory and constitutional bounds. Where rezoning, permitting, annexation, or land use ordinance revisions are concerned, federal and state constitutions, state statutes, judicial decisions, and local ordinances generally prescribe basic contours concerning what may and may not be done. Certain key decision points are thereby identified as a matter of law; procedural requirements for notice and hearings are specified; voting requirements applicable to relevant governmental entities are stated; mandates for open meetings are imposed; and standards for judicial review in the event of an appeal are delineated. While the legal framework just described also has significant bearing on the development of management strategies for drinking water watersheds, it is unfortunately not always well suited in and of itself for facilitating the development of sound

policy decisions relating to watershed management.

Three major shortcomings of the existing legal system are worth special note. First, the substantive legal principles for resolving disputes are, in a number of relevant respects, simply incomplete or unclear. In an area such as watershed management where novel strategies may be needed to reach public

"Three major shortcomings of the existing legal system are worth special note. First, the substantive legal principles for resolving disputes are, in a number of relevant respects, simply incomplete or unclear. . . . In addition, the existing legal system lacks flexibility. . . . Finally, the legal system does not provide for effective collaboration among affected parties, decisionmakers and jurisdictions."

principles for resolving disputes are, in a number of relevant respects, simply incomplete or unclear. In an area such as watershed management where novel strategies may be needed to reach public

policy goals, statutory authority may not yet exist to ensure that certain sorts of regulatory tools or expenditures of public funds can be undertaken without challenge. The process of statutory reform may be slow and difficult, particularly if one or another segment of the community prefers the status quo and opposes legislative action. In addition, some of the most significant legal doctrines that may come into play in the event of appeals from governmental action are notoriously ambiguous. Traditional doctrine designed to address conflicting land uses (such as the law of nuisance) involves a careful fact-oriented balancing process whose outcome can be difficult to predict. The development of constitutional "taking" doctrine as a means for preventing excessive regulation by governmental entities has become increasingly unclear over the past several years, as the United States Supreme Court has rendered numerous split decisions and made a number of confusing distinctions concerning the weight to be afforded certain sorts of governmental purposes, the need for close relationships between governmental purposes and the regulatory scheme employed, procedural requirements that must be satisfied, and the availability of a compensation remedy in certain exceptional cases.

In addition, the existing legal system lacks flexibility. It is designed to ensure that decisions are reached at appropriate check points, rather than to encourage the compilation of adequate information over an extended period. It tends to sanction win-lose resolutions following expensive judicial appeals, rather than to facilitate development of win-win solutions designed to accommodate diverse competing interests following extensive informal consultation. It provides few opportunities for give and take, the raising of questions and provision of answers by a wide range of citizens, government officials and staff, and the sort of frank discussion (at times off the record) and brainstorming that may be needed to develop sound policies.

Finally, the legal system, as it is now constituted, does not provide for effective collaboration among affected parties, decisionmakers and jurisdictions. The formality of the decision-making process just noted has as its flip side the relative absence of established frameworks for informal

collaborative interchange among citizens, staff and elected officials. Governing boards are expected (and wish) to preserve their autonomy and decision-making power, and may curb informal discussions with any given citizen group or interest in order to ensure that no one group or interest has undue influence. Hearings are inefficient methods for gathering use-

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ful insight into very complex issues, since they often come far along in the decision-making process after draft proposals have been developed, result in contentious debates once tempers have flared, and provide only limited time for submission of brief formal comments. When multiple jurisdictions are involved in regulating within a given watershed, difficulties are compounded, since there is generally no established forum for discussion on an intensive basis between affected officials, press reports may provide a limited or incorrect portrayal of related events, and there may be a history of difficulties in communication or distrust between relevant officials or governments. In addition, staff may feel obliged to focus only on their jurisdiction's independent interest rather than on cooperative solutions in the interest of the area as a whole. It may also be difficult to coordinate differing decision-making processes of several jurisdictions that involve unique traditions, ordinance provisions, and advisory boards.

4. Difficulties in Creating Effective Solutions. Solutions to watershed management dilemmas may well be more difficult to develop than those in other settings for many of the reasons noted above. There is as yet only a limited track record of strategies that have proved effective in this context. As a result, many jurisdictions (and their planners and elected officials) may need to invent solutions for themselves, rather than being able to rely on examples from elsewhere or from their own past experience. Solutions may, in any event, need to be relatively unique, in light of the differing characteristics of watersheds, reservoirs, established ordinance structures, and relevant political concerns. They may need to be unusually comprehensive, involving not only novel forms of land use controls, but also engineering requirements, expenditures of funds for land acquisition, additions to inspection staffs, and coordination of farmland preservation and affordable housing initiatives. They may also arise only after heated debate leaves the community deeply divided and lacking in common ground, and it may be difficult in such circumstances to develop a constituency for a middle course rather than one or another win-lose solution. Solutions may also require the collaboration of

several different area jurisdictions, but at the same time entail careful coordination rather than adoption of identical strategies. A balance of complementary skills, willingness to learn, and mutual respect on the part of staff and elected policymakers may be critical. The necessity for technical expertise, creative insight, trust, and respect for others'

viewpoints and autonomy may be more than many jurisdictions can muster without careful preparation and thought.

One Area's Response

The experience of area governments in addressing the need for improved management strategies within the University Lake watershed not only yielded insight into the existence of the difficulties just described, but also resulted in some effective and creative responses to these dilemmas. Because planners and elected officials in other jurisdictions may find it useful to draw upon the University Lake watershed experience in formulating their own responses to these difficulties, it is worth describing that experience in more detail here.

1. Defining the Problem. Carrboro, Chapel Hill and Orange County officials were able to finesse the difficulties of defining the problem of watershed management by proceeding on several different tracks.

Although steps had been taken earlier in the decade by Carrboro and Orange County to adopt land use regulations that would ensure adequate protection for the University Lake watershed, a major re-examination of the watershed management problem came about as a result of a private developer's proposal for construction of the Amberly project in 1986. Carrboro initially attempted to develop a sound response to the issues presented by the project (including the appropriate level of density restrictions, the availability of cluster rather than large-lot development, access to public water and sewer, and application of appropriate buffer and road location requirements). The matter remained under consideration for more than a year, during most of 1986 and part of 1987. Debate within the Carrboro Board of Aldermen also focused on whether the project should be considered within the terms of existing or revised regulations, the extent of discretion in reaching annexation and rezoning decisions, and the obligations of OWASA to provide public water and sewer if Carrboro officials concluded that the provision of public sewer service was more

environmentally safe than reliance on septic systems that could potentially fail. The debate at times became acrimonious, resulting in an initial decision by a board split 3-4 not to approve the project, a later decision by a vote of 4-3 to approve the project, litigation by both opponents of the project and the developer challenging board decisions, and significant changes in the membership of the board after a bitterly contested election marred by innuendo.

Efforts to address the problem of University Lake watershed management also proceeded on several additional fronts during this period and the years that followed, however. Officials from Carrboro, Chapel Hill and Orange County had in prior years discussed strategies for joint land use planning within the southern part of Orange County, after Chapel Hill's request for extended extraterritorial jurisdiction had been rejected by Orange County. The joint planning discussions had not gained significant momentum, however, until the Amberly controversy proved a catalyst for resolution of a number of interrelated planning issues, including the issue of watershed protection. A work group of representatives from the Carrboro Board of Aldermen, Chapel Hill Town Council, and Orange County Board of Commissioners convened and met on a weekly basis during the fall and winter of 1986-87, seeking to develop an agreement in principle that would resolve key issues that had prevented adoption of a joint planning scheme. The result was a brief multi-faceted proposal which described areas of concurrent authority for the two towns and the county, established a rural buffer/greenbelt which would not receive public water and sewer and would not be subject to annexation for a number of years, and which recognized that the governments continued to disagree about the response to be made to the Amberly proposal (acknowledging that Carrboro would ultimately have to resolve that matter on its own, while taking into account the views of adjacent jurisdictions). The agreement in principle also contemplated that OWASA would commission a major study of the University Lake watershed, in order to provide the necessary information base for subsequent review of Carrboro and Orange County ordinances and OWASA policies. The ability to reach agreement on these matters provided an important foundation that stimulated trust and willingness of the area jurisdictions to continue to work together on watershed policy development in the ensuing years.

The University Lake watershed study was completed in 1989, as discussed in more detail below. Again, the three jurisdictions had to work together to define the precise watershed management problem to be addressed at the next stage of policy development. Although discussions continued regarding whether other water supply watersheds in the area should also be subject to policies developed with an eye toward the University Lake watershed, the interjurisdictional work group that proposed strategies for University Lake watershed management ultimately con-

centrated its attention and recommendations on the University Lake area, rather than venturing farther afield to include the distinctive Cane Creek watershed and other water supply watersheds in the northern part of Orange County, as some members had urged.

2. Developing an Information Base. The University Lake watershed study just mentioned, undertaken by Camp, Dresser and McKee pursuant to a contract with OWASA, provided critical technical information on the University Lake watershed. The study was commissioned by OWASA, upon agreement by the affected jurisdictions to defer further action regarding watershed management regulations until more information could be gathered. The study included an inventory of the watershed (concerning existing land use, soils, topography, and hydrology), an estimate of nonpoint pollutant loading, the creation of five alternative development scenarios for the watershed (including existing local land use plans, one-acre residential zoning, five-acre residential zoning, variable density cluster development, and high density urban development), the use of a pollutant loading/reservoir model to predict the water quality effects of each scenario, and watershed management recommendations. Both a technical advisory committee and an advisory committee composed of government officials were appointed to provide additional advice and gain additional information during the course of the study, but these committees were used only to a limited extent. The consultants did, however, hold public meetings to describe the study methodology and preliminary findings along the way.

The consultants ultimately developed a model that they believed would be useful in projecting pollutant loading under the various development scenarios described, recommended a goal of preventing significant future deterioration of water quality, focused on total phosphorus and chlorophyll *a* concentrations as indicators of pollutant loadings, identified structural and nonstructural strategies for achieving the goal of minimal degradation, discussed the costs and risks associated with structural strategies such as use of wet detention ponds, and recommended nonstructural strategies including use of large lot (five acre) residential zoning, a four percent impervious surface limitation, and preservation of vegetated buffers. They also recommended adoption of conventional septic systems rather than community systems or public sewer systems at least where strict controls on size and capacity would not be sufficient to overcome pressures for more intensive development.

While the Camp, Dresser and McKee study did a great deal to expand the technical information base, it did not attempt to address the full range of land use planning issues posed by watershed management initiatives, and the difficult questions related to the diverse concerns of various political constituencies. It also in and of itself provided no mechanisms for bringing about dialogue and understand-

ing between citizens, planners, those with technical expertise, and elected officials from the area's jurisdictions.

Subsequently, in the summer of 1989, representatives of the elected boards of Orange County, Carrboro, and Chapel Hill convened for discussions concerning how to respond to the study's recommendations. An intergovernmental committee created to address planning, water, transportation and related issues in Orange and Chatham Counties had been established a year earlier, and provided an available and effective vehicle for discussions among elected officials who had already become reasonably comfortable in working together. The intergovernmental committee was assisted by a working group of staff members from Orange County, Carrboro, Chapel Hill, the Triangle J Council of Governments, and OWASA. Through intensive meetings every week or two during late August, September, and October 1989, the committee of elected officials, along with the committee of professional staff, were able to discuss at some length the Camp, Dresser and McKee findings and recommendations, as well as to develop additional information concerning planning issues, address questions related to the impact on land values of stringent density constraints, and identify significant historical and emotional issues that underlie the political differences between constituents in various areas. Of particular importance was the forthright discussion of disagreements concerning the allocation of benefits and burdens associated with the regulations (should water users be obliged to pay compensation to landowners subject to stringent regulatory constraints, or should landowners be obliged to refrain from development that might adversely affect water users?), the strong sense of inequitable treatment and historical grievances concerning the area's school system and economic development that continued to trouble rural landowners (but had been relatively invisible to residents of the towns), and the potential stake that all members of the community had in trying to develop a mutually agreeable solution. These concerns might initially have been dismissed as "political" in nature by certain of the area's leaders, but by the concluding phases of the discussion they were understood to be significant, legitimate, and very real.

3. Creating an Appropriate Decision-Making Process. The process for developing sound management strategies for University Lake watershed relied both upon legally-mandated mechanisms for reaching governmental decisions, and upon more informal mechanisms designed to supplement the decision-making process. The affected governments continued to comply with requirements concerning notice, hearing, permitting and rezoning requirements, and requests for special legislation to authorize novel mechanisms for cooperative planning and unusual means of land use control. Indeed, the uncertainties associated with legal doctrine and potential litigation at times increased the pressure for development of balanced, well-justified solutions that took

into account the many viewpoints expressed over the several years of community discussions concerning the most appropriate management strategies for University Lake watershed.

On the other hand, the informal processes used in developing a strategy for University Lake watershed management contributed in significant ways to the development of a better understanding of the problem and the development of more satisfactory solutions. As noted above, a multi-stage process was used in defining the problem and addressing it on several levels, including not only the project-specific level, but also the watershed-wide level, and the area-wide level (insofar as it was necessary to take into account other related issues such as the need to identify non-watershed areas as focal points for residential and commercial growth, and to specifically address the problems of rural character in non-watershed areas of the county). In addition, a more flexible and collaborative process allowed elected officials and staff members to gather and pool information, identify common goals, flag areas where consensus was lacking for further discussion and exploration, identify areas of ultimate agreement, brainstorm about possible solutions, and respectfully disagree where agreement could ultimately not be reached.

That is not to say that there were no flaws in the process used. Although the meetings of the intergovernmental group that ultimately developed recommendations to area jurisdictions were open to the public, and comments from members of the audience were invited and welcomed at meetings, some citizens may have felt that they would have liked more formal opportunities for providing comments during this process, or may have concluded that this process of discussions among staff and elected officials did not provide an adequate role for landowners and other interested citizens before momentum grew in support of some sort of collaborative solution. In addition, a significant effort was needed to provide adequate information to all interested members of the public, a goal that was partially, but not completely, achieved. Members of the staffs of area jurisdictions and some members of governing boards also felt constrained late in the process to raise questions or recommend changes in certain facets of the compromise developed by the intergovernmental work group, in order to address specific concerns raised by constituents or problems that they believed were not adequately taken into account by the compromise proposal. Finally, an ideal solution would have been one supported by all members of the community. Despite efforts to develop a compromise that would take into account the full range of concerns among water users, landowners, and others, feelings still ran high at the time of hearings concerning proposed watershed management regulations, and a sense of division between those benefited and those burdened by such regulations remained.

Nonetheless, the use of a more flexible process that provided for informal gathering of information, discussions

among staff and elected officials, and development of a compromise designed to help local governments develop necessary regulatory provisions in a coordinated and timely fashion contributed significantly to the adoption of a careful, balanced, and sophisticated set of watershed management policies in a relatively short time. The substance of those regulations and related measures taken by area governments and OWASA is outlined below.

4. Creating Effective Solutions. The creation of an effective solution for University Lake watershed was helped significantly by the steps outlined above (developing a multi-faceted definition of the problem, creating a sound and comprehensive information base, and developing a more flexible, collaborative decision-making process). Important lessons can also be learned from the substance of the solutions ultimately adopted.

The basic Camp, Dresser and McKee recommendation of five-acre minimum lot sizes with private septic systems was ultimately adopted by both Orange County and Carrboro, with certain modifications. Among the most significant modifications was the recognition that existing lots of record could be subdivided so as to create not only large lots of five acres or more in size, but also a small number of lots between two and five acres in size in order to mitigate the hardship feared by landowners. An option for cluster development was also permitted (provided that stringent impervious surface limitations were satisfied, structural stormwater control mechanisms were implemented in appropriate cases, a one-acre minimum lot size was observed, an overall density of no more than one unit per five acres was satisfied, and septic systems rather than community systems were utilized). Orange County and Carrboro ultimately disagreed on the appropriate level of impervious surface controls to be applied to land within their respective jurisdictions, with Carrboro preferring a four percent impervious surface limitation for lots of five acres or more, and six percent for lots between two and five acres; and Orange County adopting a sliding scale of impervious limits with a maximum of six percent for five-acre lots and a maximum of twelve percent for two-acre lots. Vegetative buffers were mandated, controls on lot placement and siting of structures specified, and other regulatory requirements adopted.

In addition, a number of other policies related to watershed management were identified for future consideration by area jurisdictions and OWASA. Orange County planned to pursue the development of strategies for dealing with special hardships that might be suffered by farmers, and OWASA agreed to create a watershed protection fund to acquire fee simple title or development rights in particularly sensitive land within the watershed. OWASA also adopted a policy of generally prohibiting extension of public water and sewer into the University Lake watershed, and continued its extensive water quality monitoring program.

Conclusion

The University Lake story is intended only to provide a starting point, not an ending point, for discussion of strategies for watershed management. The lessons learned by those who sought to develop a solution for the University Lake watershed were many—including the need to define the scope of watershed problems carefully; the importance of a shared information base including both technical, planning and political information; the usefulness of flexible, collaborative decision-making processes that can supplement traditional legally-mandated decision-making mechanisms; and the possibilities for creative solutions that take into account the diverse concerns and many variables involved in development of watershed management policies.

A number of the government officials, university professors, and staff involved in the University Lake watershed negotiations believe that it is possible to learn how to work more effectively in solving such difficult problems. To that end, your help is requested. It would be very useful to learn of your own stories about dealing with difficult watershed management issues, so that we could develop a set of detailed case studies to be shared with other jurisdictions that are about to commence their own journey through uncharted waters. In addition, we hope to develop a detailed simulation exercise, based on the University Lake experience, for use by staff and government officials who would like to gain experience with a "dry run" involving watershed management issues before embarking on their own real life adventures. To make such an experience most meaningful, we would like to develop such an exercise in conjunction with staff and elected officials in other jurisdictions who might consider participating in such an exercise at no or minimal cost. If either of these ideas interests you, please contact the author at the University of North Carolina School of Law, CB 3380, Chapel Hill, N.C. 27599, or phone (919) 962-4417. □

Acknowledgements

The author wishes to express special thanks to Julie Andresen, member of the Chapel Hill Town Council; Andy Sachs, Orange County Dispute Settlement Center; Roy Williford of the Carrboro planning department; Ann Weeks, formerly Carrboro senior planner; Kimberly Brewer, formerly of the Chapel Hill town planning staff and now a member of the Triangle J Council of Governments staff; and Ed Holland, OWASA research and planning administrator, for their comments on an earlier draft or their willingness to provide important information that contributed to this essay. She would also like to recognize the important information and insights provided by Ed Holland's paper "Water Quality Goals and Watershed Management Decisions" and by the Camp, Dresser and McKee University Lake Watershed Study. Finally, she wishes to thank the National Institute for Dispute Resolution, the National League of Cities, Professor Carl Moore, Jim Kunde, and Roberta Miller, for the opportunity to gain additional insight into dispute resolution techniques through the training she received in connection with the National League of Cities' Council Mentors program. Responsibility for any errors in this account remains, of course, the author's own.

A Report Card on Urban Erosion and Sedimentation Control in North Carolina

**Raymond J. Burby, Edward J. Kaiser, Michael I. Luger,
Robert G. Paterson, H. Rooney Malcom, and Alicia C. Beard**

In 1973 North Carolina enacted what has become one of the most stringent erosion and sedimentation control programs in the nation. This article discusses how a survey of 128 construction sites in North Carolina turned up evidence that practice falls short of state goals to curb urban erosion and sedimentation. The authors then discuss policy options to remedy these shortcomings.

Construction activity in urban areas can increase the amount of soil--up to 500 tons for every acre laid bare--that washes from building sites into nearby rivers, streams and lakes. When erosion and sedimentation go unchecked, a variety of harmful and costly effects result. Aquatic habitat is destroyed, decreasing aesthetic values and fish production. Streams accumulate dirt, losing their capacity to store flood waters and increasing the frequency and severity of flooding. Reservoirs silt up and lose their capacity to store drinking water, requiring additional expenditures for replacement supplies. Channels become clogged, requiring more frequent dredging to maintain navigation. Storm drainage works no longer function as intended, resulting in nuisance flooding and more frequent maintenance. The frequency and severity of those problems have led twenty-one states to formulate programs to control urban erosion and sedimentation.

In 1973 North Carolina enacted what has become one of the most stringent erosion and sedimentation control programs in the nation, matched only by similarly vigorous state programs in Florida, Maryland and Virginia.¹ In this article we provide evidence that in North Carolina practice falls short of state goals to curb urban erosion and sedimentation.

The shortcomings in program practice are the result of slippage at each of four stages. First, a small but significant proportion of urban construction evades the program's regulatory net (that is, grading is begun without attention to erosion and sediment control). Second, erosion and sediment control plans prepared for construction sites sometimes have serious technical deficiencies that limit their potential effectiveness. Third, erosion and sediment control measures specified by those plans frequently are not installed. Fourth, even when measures are installed as specified, they frequently are not maintained adequately.

As a result of those problems, a third or more of urban construction sites release large amounts of sediment to adjacent property and to nearby streams and other water bodies.

The difficulties encountered in North Carolina are serious, but they are not insurmountable. In concluding this article, we suggest a number of options that state and local policy makers can consider to halt, and even reverse, the slippage we identified. Most of those policies stress the importance of establishing a cooperative approach to enforcement that builds commitment in the private sector to the program's goals and private capacity to comply before sanctions must be invoked. We also stress, however, the importance of effective sanctions that can be applied quickly when provisions of the law are ignored. We believe our research findings are relevant to a variety of local and state regulatory programs and have applicability beyond control of urban erosion and sedimentation in North Carolina.

Sources of Data

Data for this article come from a comprehensive evaluation of the North Carolina Erosion and Sedimentation Control Program, commissioned by the N.C. Department of the Environment, Health and Natural Resources.² A number of different approaches to data acquisition were employed.

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We gathered information about erosion and sedimentation control practices and effectiveness in nine locales across the state. The nine locales include three from each of the three physiographic regions of North Carolina--the coastal plain, the piedmont and the mountains. In each region, we selected one county where the state administered the program and one city and one county where local governments administered the program (see map below). After first completing a pilot study in Orange County to develop a field protocol, we collected data in each of the nine locales through structured interviews with supervisors, plan reviewers, and inspectors, through inspection of records and other documents, through technical review of control plans developed for construction projects under the regulations, and from field inspections of those projects.

The control plan reviews and field inspections focused on a random sample of 128 construction projects, selected from the active projects of the agencies in the nine locales. This approach provided a representative sample of residential projects and non-residential projects (mostly retail commercial and office developments) in the private sector. (See Table 1 for the number of sites by type of land use in each of the nine locales.) We collected information on each project through technical

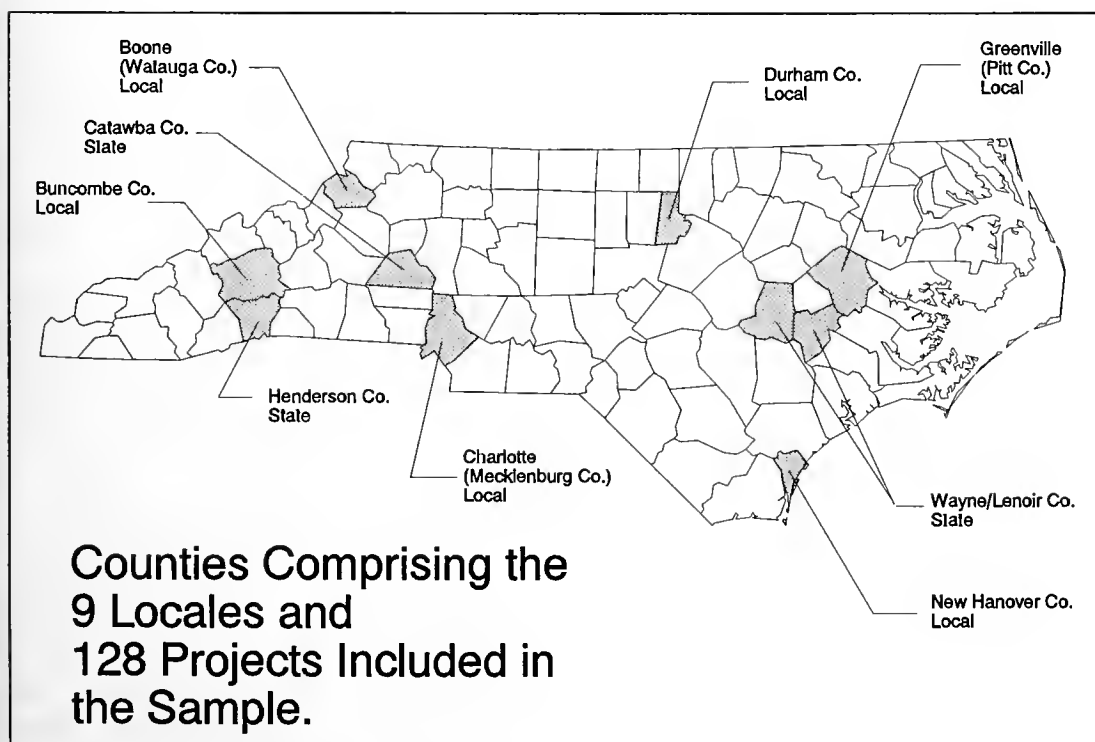
Table 1. Number of Construction Sites in Sample for Each of Nine Locales

Locale	<u>Residential</u>		<u>Non-Residential</u>		Total
	State	Local	State	Local	
<i>Coastal Plain</i>					
Wayne/Lenoir Counties (Washington Office)	11		4		15
New Hanover County (locally administered)		5		10	15
Greenville (locally administered)		6		9	15
<i>Piedmont</i>					
Catawba County (Mooresville Office)	5		9		14
Durham County (locally administered)		6		9	15
Charlotte (locally administered)		3		11	14
<i>Mountains</i>					
Henderson County (Asheville Office)	11		4		15
Buncombe County (locally administered)		4		10	14
Boone (locally administered)		5		6	11
<i>Totals</i>					
State Totals	27		17		44
Local Totals		29		55	84
Residential	56				
Non-residential			72		
<i>Grand Total of Construction Sites</i>					
					128

evaluation of its erosion and sedimentation control plan, on-site observations of erosion and sedimentation control measures as installed and maintained, and observations of off-site sediment pollution. We gathered additional information about the projects from a mail survey of the projects' owners and developers. We received 103 responses, providing data on the developers of 80 percent of the 128 projects.

To provide a broader perspective on the program, we

surveyed by mail the administrators of all seven state regional offices and 27 of the 37 cities and counties with local programs. We also conducted a telephone survey of the representatives of various groups interested in the program. The survey of interest group representatives covered 33 organizations, including oversight groups such as the N.C. General Assembly and N.C. Sedimentation Control Commission, professional groups, trade groups, and environmental groups. These structured interviews probed people's opinions about the



strengths and weaknesses of the program and their recommendations for improvement. Finally, we conducted a mail survey to determine North Carolina citizens' willingness to pay for the program. We obtained responses from 319 households surveyed in three metropolitan areas--Buncombe County, representing the mountains; Durham County, representing the piedmont; and New Hanover County, representing the coast and coastal plain.

In combination, the data collected for this evaluation provide the most comprehensive set of information ever assembled about the performance of urban erosion and sedimentation control in any state. These data provide a sound basis in fact and in opinion with which to evaluate the program and to suggest improvements.

Slippage at Stage One: Coverage of the Eligible Population

Slippage at Stage One addresses cases in which builders do not submit erosion and sedimentation control plans or obtain approval of those plans before proceeding with clearing, grading, and construction of projects over one acre in size. About 25 percent of the construction projects regulated by the state and about 10 percent of those regulated by local programs which were in violation of the law were initially detected through surveillance and follow-ups to citizens' complaints. They did not come to the attention of agencies through normal channels. Since neither state agencies nor local governments devoted much time--less than 10 percent of available personnel--to general surveillance to detect land disturbing activities taking place without approved erosion and sedimentation control plans, the data suggest to us that slippage here could be serious, particularly in areas of North Carolina where the program is administered by the state.

Slippage at Stage Two: Preparation of Technically Adequate Erosion and Sedimentation Control Plans

The erosion and sedimentation control program does not prescribe most of the specific measures developers must employ to prevent erosion and retain sediment within the bounds of their projects. Instead, it relies on performance standards that developers must meet by preparing and implementing unique plans for every construction site. Stage two slippage can occur if those plans, which are approved by state and local regulators, have technical deficiencies. Even if perfectly implemented, they would not prevent sediment from leaving the construction site.

Interviews with plan review staff indicated that serious deficiencies in the quality of plans when first submitted by developers and their engineering consultants are the rule rather than the exception. Even after staff review and the correction of plan deficiencies, we found that approved

plans could still have a variety of shortcomings. The most frequent problems noted on control plans were those allowing drainage areas that exceeded the capacity of control devices, leading to hydraulically overloaded devices, and over-reliance on silt fences. Furthermore, we inspected the performance of the plans in the field and found that 27 percent of the sample projects had lost sediment because plans failed to specify the placement of sediment control devices everywhere they were needed.

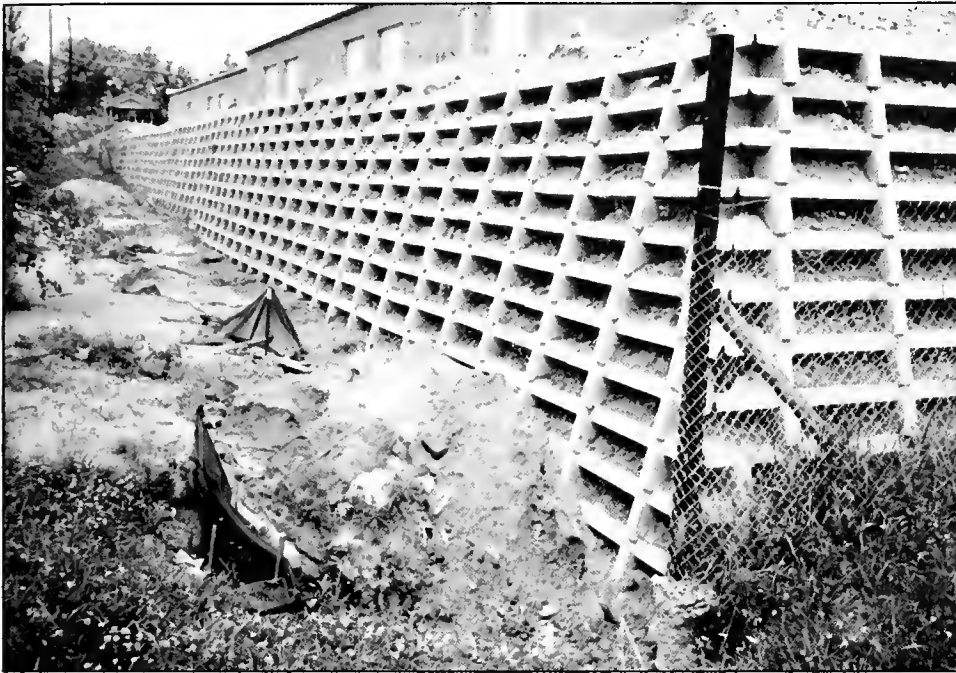
To further evaluate the overall adequacy of control plans, we developed systematic ratings of each of the 128 control plans. The rating scale for the plans ranged from 0 to 100, with a rating of 100 representing a plan which adequately handled all of the sediment generated on site. The meaning of the ratings is as follows:

<u>Rating</u>	<u>Description</u>
100-90	Excellent
90-80	Good
80-70	Satisfactory
70-0	Unsatisfactory

The ratings were calculated by starting with a perfect score of 100 and subtracting points for each time an aspect of sediment control was not adequately handled. Bonus points were given to plans which included exceptional notes to the contractor concerning specific grading problems. The following list indicates the areas of inadequacy and their corresponding additions and deductions.

<u>Area of Inadequacy</u>	<u>Points</u>
<i>Relating to Notes:</i>	
Vagueness: "Silt fence placed where necessary"	-20
No stated order of construction	-10
Lack of clarity of notes	-15
Incomplete or missing details	-15
<i>Relating to plan drawings:</i>	
Perimeter point not treated	-10
Construction exit not shown	-10
Water escapes site without encountering any measure	-20
Basins or traps are too small	-15
<i>Bonus points:</i>	
Notes concerning grading	+5
Note to minimize time of exposure	+5
Note to minimize disturbed area	+5

We found that the quality of approved control plans was on average satisfactory--the average score for all 128 projects was 75--but the quality of plans varied significantly among the nine locales we studied. The scores ranged from a low of 57 to a high of 89. On average, the quality of plans submitted to and approved by state regional agencies scored 11 points lower than the quality of plans submitted to and approved by local programs. We attribute the higher



Bad practice: This retaining wall and associated silt fences failed, allowing water and soil to seep through.

quality of plans approved by local agencies not to differences in the proficiency of their respective staffs--state staff, in fact, tended to be more highly trained--but to the fact that local agencies, on average, spent twice as much time per plan on plan review as did the state's regional offices.

Slippage at Stage Three: Installation of Measures Specified by Approved Plans

Even good control plans will fail to prevent erosion and sediment pollution if the measures they specify are never installed. The field inspections we conducted at 128 construction sites revealed that on-site compliance with control plans was poor; 30 percent of measures specified in plans were never installed at the construction sites. It was the exception rather than the rule to find all of the control measures specified on approved plans actually installed.

Contractors have an economic incentive not to install required measures if their violations of the law are likely to go undetected and unpunished. We estimated the costs of implementing each of the 128 control plans we reviewed. On average, full compliance with the plans would have cost \$2,700 per acre or almost \$18,000 for the average of 6.64 acres of disturbed area per project. Because of incomplete installation of required control measures the average costs actually incurred were \$1500 per acre or \$9,960 per project. Thus, developers or their grading contractors saved an average of \$1200 per acre, almost \$8000 for a typical project, by not complying fully with the specifications of the control plans. Slippage of that magnitude occurred because of lack of adequate staff to inspect sites and lack of

adequate tools for enforcement. These problems particularly plague state administration of the program. Five of seven state regional offices had only enough staff to inspect construction sites once a month or less frequently to ensure that required measures were installed and maintained, and to work cooperatively with developers to correct problems (see Figure 1). In contrast, only 19 percent of the local programs we contacted inspected construction once a month or less frequently, and 44 percent inspected sites more often than monthly. Reflecting those differences, we found a somewhat higher proportion of sites regulated by local programs than state regional offices, 40 percent versus 30 percent, to be in complete compliance with approved plans.

Neither state nor local programs pursued enforcement vigorously during the year of program operation we studied, possibly because of a pending court case that questioned the legality of fines imposed for

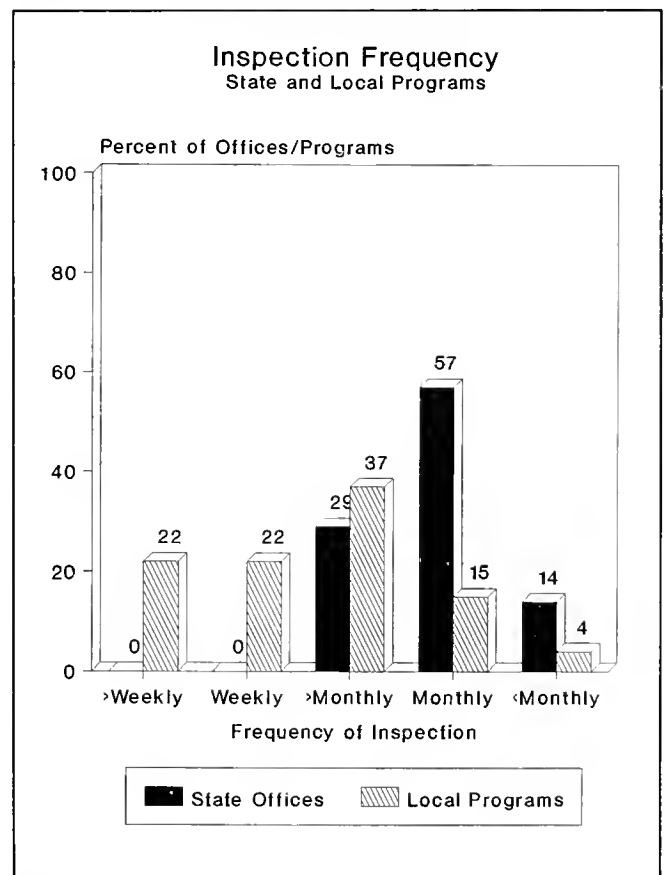


Figure 1.

noncompliance with provisions of the law.³ During the last year of record, state and local sediment control officers conducted over 57,000 inspections of construction sites, but they issued only 1,655 formal notices of violation. Only 182 fines were subsequently imposed, a strikingly low number given the degree of noncompliance we found in the field.

State administrators also lack a full complement of enforcement tools, since unlike local programs, the state is not authorized to issue stop work orders. Since "time is money" to developers, stop work orders are a formidable incentive to comply; therefore, the state's inability to use this device is a serious constraint on regulatory efficiency. Injunctions, the alternative available to the state, are cumbersome legally and take considerable time--a month or more--to employ (and time is critical in preventing sediment damage). As a result, injunctions were rarely sought by either state or local programs. Additionally, the state cannot require developers to post performance bonds or letters of credit; thus, if a developer ceases operation, funds may not be available to complete permanent stabilization of the site to prevent erosion and sedimentation pollution.

Slippage at Stage Four: Maintenance of Measures Installed

Shortfalls in inspection and enforcement also contributed to slippage in maintenance. This a critical problem, since failure to repair damaged or overloaded control devices can allow sediment to escape from construction sites. For both state and local jurisdictions, we found that 51 percent of control measures were not adequately maintained. Fewer than one in five of the 128 construction sites we inspected had all of its sediment control measures in full working order. Typical maintenance shortfalls included problems such as failing to muck out traps when they became more than half full, failure to replace silt fencing or storm drain inlet protection devices that had been knocked down, and failure to repair gravel filters that had been damaged by construction activities or storm events. Those and other maintenance deficiencies are illustrated by Figure 2, which shows the percentage of each of the ten most widely used erosion and sediment control measures that were not maintained adequately at the 128 construction sites we inspected.

The Bottom Line: Attainment of Program Goals

As a result of the technical deficiencies in plans and failures to install and adequately maintain erosion and sediment control measures specified in plans, the North Carolina erosion and sedimentation control program is not fully achieving the goals set forth in the Sedimentation Pollution Control Act. Here we draw upon field inspections of construction projects, agency administrators' evalu-

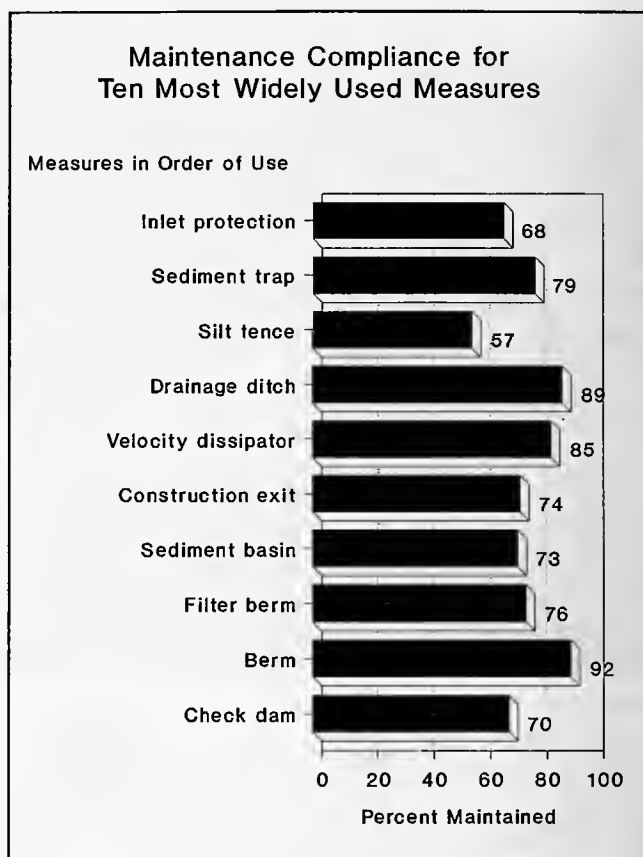


Figure 2.

ations, and interest group evaluations to support that assertion.

The primary goal of the Sedimentation Pollution Control Act is to keep sediment pollution within the boundaries of construction projects. This bottom line goal was attained completely at 39 percent of the construction sites we inspected. The fact that less than half of the construction sites complied with the program's key performance standard--retention of sediment on the site--reflects the inherent infeasibility and inefficiency of preventing all sediment from reaching water bodies. Part of the sedimentation problem obviously cannot or, for economic reasons, should not be prevented from occurring. For example, some particles are too fine to be captured in entrapment devices. In recognition of that fact, we distinguished between minor losses of sediment (less than thirty cubic feet) and major losses (losses of thirty cubic feet or more, or losses of any magnitude directly into streams and other water bodies). We found serious losses of sediment at 33 percent of the construction sites we inspected. Approximately one-third of sites regulated by both state regional offices and local programs experienced major losses of sediment. However, a higher percentage of state-regulated construction sites than construction sites regulated by local programs (41 percent versus 22 percent) experienced minor losses of sediment, reflecting greater slippage at

each of the stages of the control process we examined.

As a final way of gauging the performance of the erosion and sedimentation control program, we asked program administrators and the group representatives we consulted to rate the program in terms of its accomplishment of two key goals: protection of water quality and prevention of sediment damage to property adjacent to construction sites. The following percentages rated program performance as excellent or good:

Table 2. Percent Rating Performance as Excellent or Good

	Protection of Water Quality	Prevention of Sediment Damage
State administrators (n = 7)	29%	43%
Local administrators (n = 27)	63%	74%
Legislators (n = 5)	0%	0%
Sedimentation Control Commission (n = 8)	50%	63%
Professional groups (n = 13)	38%	46%
Trade groups (n = 11/10)	27%	30%
Environmental groups (n = 18)	11%	11%

Those figures, we believe, reflect rather widespread recognition of the slippage in control which we found in the field and document in this article. Until that slippage is corrected, we do not believe the program will be able to achieve consistently high performance ratings from either program administrators or groups interested in and affected by its operation.

Policy Options for Improving Program Performance

There are a number of ways to improve the performance of the North Carolina Erosion and Sedimentation Control Program. Those that we think have some merit and deserve further analysis are presented here for each of the stages of the program where slippage was detected. Readers should be aware that these are presented as ideas for further discussion and analysis; we have not analyzed them in terms of either their cost-effectiveness or feasibility. Thus, we put them forward to stimulate discussion and additional policy analysis and not as a set of policy recommendations.

Stage One: Failure of Eligible Land Disturbers to Submit and Obtain Approval of Control Plans Prior to Clearing, Grading, and Construction

A 1981 evaluation of the North Carolina Erosion and Sedimentation Control program sponsored by the University of North Carolina Water Resources Research Insti-

tute estimated that fully half of all land disturbing activities occurring at that time were not being captured by the program. By 1990, we estimate that stage one failure had fallen to about 10 to 20 percent of the eligible population, a significant improvement over the decade of the 1980s. Improved program coverage may reflect greater public and industry awareness as well as the effect of 1988 legislative amendments that prohibit issuance of building permits to projects that are eligible for erosion and sedimentation control program coverage but have not obtained approval of their erosion and sediment control plans.

While progress has been made, in our opinion, coverage of the eligible population is still too low. The following policy options address that problem:

1. Increase promotional activities to attain public awareness of the program. Consider establishment of a 1-800-Sediment Control Hotline and the use of streamwatch programs to supplement agency surveillance.
2. Increase program funding of surveillance activities, including ground-level surveillance and aerial surveillance.
3. Enhance intergovernmental cooperation in surveillance by training inspectors associated with other programs so that they can detect and report violations of the law.
4. Incorporate the emerging technology of geographic information systems (GIS) in the detection and surveillance functions.

Stage Two: Technical Inadequacy of Approved Erosion and Sediment Control Plans

A variety of factors contribute to the quality of the erosion and sediment control plans we inspected. For example, when agencies are overloaded with plans submitted for review, some control plans are approved by default when the 30-day time limit for completion of agency reviews is exceeded. Overburdened agency personnel find that they have inadequate time to check all hydraulic calculations, particularly when the original plan submitted is especially rudimentary. Inaccurate topographic maps are another source of problems. Ideally, plan reviewers should visit proposed construction sites to check topographic accuracy and to hold preplan conceptual conferences with plan designers; however, program staff in only a few of the locales we visited had time for that. In addition, many agency administrators and plan reviewers strongly believe in the need to improve the quality of the control plans on initial submission, which will require incentives for developers to invest in better plans.

The problem of control plan adequacy also raises a fundamentally important question concerning the program's performance-standard rather than specification-standard orientation. Performance standards are markedly more difficult to administer than specification standards. As knowledge about the appropriate design and effec-



Good practice: A slope drain, anchored in rip-rap, channels run-off to where it won't erode the slope.

tiveness of various erosion and sediment control measures becomes more certain, it may be feasible to switch to more easily administered specification standards. That would ensure that control plans incorporate adequate measures based on available technical information and practical experience, and it would make control plan design, performance, and costs more predictable and, we think, the program more effective. In the meantime, we believe each of the following policy options will contribute to improvement in the quality of plans prepared and submitted for approval.

1. Establish an erosion and sediment control design certification program that all control plan designers are required to complete.
2. Establish erosion and sediment control plan submission standards to set a baseline that all plans must meet before they are accepted for review. Those criteria could include use of base maps with adequate topographic detail, delineation of proposed clearing limits, inclusion of the expected grading and construction schedule, details on temporary stabilization measures, the proposed erosion and sediment control measures with associated hydraulic calculations for runoff directed

toward devices, precautions for critical areas, sequencing of installation and removal of control measures, maintenance scheduling, and procedures for final stabilization.

3. Establish erosion and sediment control plan re-submittal fees to create an economic disincentive for submission of low quality control plans.
4. Increase staffing so that more time can be given to plans during the review and approval process. That also would allow more preplan submission conferences. Possible ways to increase review personnel include: (1) increase funding for permanent plan review positions at the state and local levels; (2) cross-train inspection personnel and plan reviewers, so personnel

can be shifted according to plan submission and monitoring/enforcement demands; and (3) allocate inter-agency or departmental personnel to plan review tasks during peak control plan review periods in late spring and summer.

5. Change the orientation of plan preparation from performance standards to specification standards to help ensure greater consistency and reliability in control



Bad practice: A rip-rap channel, designed to filter out sediment, is ineffective because a trap failed, allowing water to bypass it.

plan design. This will take advantage of available knowledge about what will work, rather than waiting to see if questionable designs will fail in the field.

Stages Three and Four: Failure to Install and Maintain Erosion and Sediment Control Measures According to the Approved Control Plan

We believe increased attention to three sets of factors may improve performance of the program by reducing slippage at stages three and four: (1) measures to stimulate voluntary compliance; (2) measures to enhance the ability of agency personnel to use persuasion effectively; and (3) measures to make sanctions against persistent violators of the law more effective.

To enhance voluntary compliance:

1. Establish greater uniformity in erosion and sediment control standards within regions or across the state to reduce variation in expectations from one jurisdiction to another. When standards differ from one jurisdiction to the next, developers can become confused and unsure about what is considered adequate performance, particularly in terms of maintenance. Greater uniformity would ease that difficulty and was favored by most developers and inspectors we contacted.
2. Increase technical assistance to increase developers' and grading contractors' understanding and appreciation of the rationale for and legitimacy of program goals and procedures. We found that when developers perceived the program's goals as legitimate, they were more likely to comply with program requirements.

To enhance agency persuasive capacity:

1. Increase funding for state regional offices, so that adequate personnel can be hired to pursue a cooperative enforcement strategy. The cooperative approach to enforcement relies on the establishment of close working relationships between the regulator and the regulated, which over time results in mutual trust and confidence. It relies on the background threat of sanctions, but focuses on persuasion and bargaining in which enforcement officers and the regulated will each make small adjustments to reflect the other's interests and points of view. We found that a cooperative approach to enforcement produced much better results than one that relied solely

on the threat of sanctions to obtain compliance. The state has had particular difficulty establishing a cooperative environment for enforcement due to a heavy work load per inspector and the large geographic areas for which inspectors are responsible. For the cooperative approach to work well for the state, inspectors must visit the sites of land disturbing activities more frequently and spend more time on each site.

2. Provide state financial assistance to local programs, so that more personnel can be assigned to surveillance and to cooperative enforcement. Not all localities have adequate staffing to pursue a truly cooperative approach; moreover, financial assistance could provide the impetus for a greater percentage of local governments to establish their own programs, which would remove some of the burden from the understaffed state regional offices.
3. Make preconstruction conferences a precondition for final approval of an erosion and sediment control plan.



Good practice: A well-designed sediment pond includes a vertical riser and trash guard.

4. Increase state efforts to train state and local inspectors in cooperative enforcement strategies. That training should emphasize the importance of one-on-one discussions with developers and grading contractors, informal verbal warnings prior to formal written notices of violation, the importance of being visible during inspections, and conducting on-site discussions during visits to monitor construction sites.

To enhance agency deterrence capacity:

1. Authorize state sediment control officers to use stop work orders where verbal and written notices of non-compliance have been ignored. The effectiveness of a cooperative approach to enforcement is contingent on having enforcement sanctions that are quick, certain, and potentially costly to persistent violators who do not take remedial action following such notices.
2. Authorize the state to require performance bonds or letters of credit for all land disturbances covered by the program. The stop work order is effective on active projects; however, it is of no use on projects where the developer has filed for bankruptcy or where land is left idle for an extended period of time. Financial performance guarantees cover such contingencies.
3. Provide enabling legislation to have certificates of occupancy withheld on all construction projects until agency personnel verify that all necessary final stabilization steps have been taken. This check-off requirement ensures that final compliance is obtained before developers become disassociated with projects.
4. Increase legal assistance from state attorneys for enforcement of cases. Inspectors may hold back from vigorous enforcement if they perceive that legal support is or will be inadequate. Since virtually all of the available sanctions now available to state regional agencies require legal intervention, that perception can create a serious hindrance to enforcement.

Citizens' Willingness to Pay for the Program

As the preceding lists suggest, there are number of ways the slippage we found in the North Carolina erosion and sedimentation control program can be reversed so that it is more effective in halting sediment pollution. Most of those policy options will require additional state appropriations to this program. Our survey of North Carolina households indicated that people in the state value the program highly and are willing to pay far more than state and local governments currently spend on its operation.

In recent years, the state of North Carolina has appropriated approximately \$2 million per year for the urban erosion and sedimentation control program, and we estimate that altogether the thirty-seven local governments with programs spend between \$1.5 and \$3 million per year. In contrast, our survey data indicate that the residents of metropolitan counties in North Carolina are willing to pay approximately \$44 million for the erosion and sediment control program. Thus, the program produces what econo-

mists term a consumer surplus of about \$40 million annually. Some of that surplus, we think, could well be devoted to improving program performance. In this article, we've documented the degree to which the program has fallen short of its goal to control urban erosion and sedimentation, and we've suggested a number of policy options for further analysis and action by state policy makers. □

Acknowledgements

The authors gratefully acknowledge the support of the North Carolina Sedimentation Control Commission and the Land Quality Section, Division of Land Resources, North Carolina Department of Environment, Health and Natural Resources, which provided financial support for the work reported in this article. We would also like to acknowledge the assistance of Jose Cabral and Maureen Heraty, students in the Department of City and Regional Planning, who helped with field work and data analysis.

Endnotes

1. The most ambitious state programs have been put in place in eight states: Delaware, Florida, Georgia, Maryland, Michigan, New Hampshire, North Carolina, and Virginia. Those states have a comprehensive, statewide program that either requires local governments to adopt regulations to state standards, or their equivalent, or allows them to do so in lieu of state administration of state standards. One additional state, New Jersey, also requires local government to adopt programs, but without a supplementary tact of direct state-level administration. Those nine states that approve local programs have authority to employ sanctions, such as power to rescind the local program or withhold state aid, to obtain compliance of local governments, and they actively monitor local government performance, including making on-site visits and requiring written reports. Florida, Maryland, North Carolina, and Virginia match a stringent regulatory approach with a significant commitment of state resources to erosion and sedimentation control, an average of twenty-seven persons per state. In the remaining states with strong programs (and each of the twelve states with weaker programs) states seem much less committed to erosion and sedimentation control, since state personnel resources average less than three persons per state.
2. A report on the full findings, *Evaluation of North Carolina Sedimentation Control Program, Volumes One and Two*, is available from the Land Quality Section, Division of Land Resources, North Carolina Department of Environment, Health and Natural Resources, Archdale Building, 512 North Salisbury Street, Raleigh, NC 27611-7687.
3. In that case, Harris-Hall appealed a \$4,200 fine assessed for violation of the Sedimentation Pollution Control Act. A superior court vacated the penalty as "arising from a legislative grant of judicial power, prohibited by Article IV, Section 3 of the North Carolina Constitution." That 1988 judgment was reversed by the N.C. Supreme Court in 1989, but while the Supreme Court's decision was pending, the case cast a cloud over the legality of the program's enforcement procedures that, according to state program administrators, may have led field inspectors to shy away from enforcement actions. (*In re Appeal from the civil penalty assessed for violations of Sedimentation Pollution Control Act*, 92 N.C. App. 1, 373 S.E.2d 572, disc. rev. allowed, 323 N.C. 625, 374 S.E.2d 873 (1988), rev'd and remanded, 324 N.C. 373, 379 S.E. 2d 30 (1989))

Greenway Use and Users: An Examination Of Raleigh and Charlotte Greenways

Owen J. Furuseth
Robert E. Altman

As with any public facility, the planning and development of greenways should be reflective of the needs of potential users and types of usage. Because of their relative short history, however, almost no effort has been made to follow up the expected use of greenways with empirical evidence concerning their actual usage. Intuitively, greenway planners and designers may have some notion of likely patronage, how the facility will be used, and where patrons will be coming from, but these perceptions may be inappropriate. Without actual information on greenway visitors and use, the planning process is guided by conjecture.

If greenway development trends of the 1980s are extended, the decade of the 1990s will see the proliferation of new and expanded greenways throughout the United States. The challenges facing greenway planners and managers are varied, but the importance of collecting and using patron data in the planning process cannot be discounted. In order to create viable, user-accessible facilities, better understanding of who patrons are, their patterns of use, and their problems and concerns must be addressed. These are critical ingredients for not only enhancing facility usage, but also building broader community support for the greenway concept.

As a result of an initial request from the North Carolina Greenways Conference Organizing Committee, the Department of Geography and Earth Sciences of the University of North Carolina at Charlotte has been involved in several case studies of greenway patronage designed to address these questions. Our research has used two of North Carolina's oldest and largest greenways, the Capital Area Greenway System in Raleigh and the McAlpine Greenway in Charlotte, as study sites. In our work we have collected data of greenway users, their activity patterns, and their evaluations of these facilities.

The research carried out on Charlotte and Raleigh greenways found several common elements between the two communities and their dissimilar greenways. While these findings relate specifically to the McAlpine and Capital Area greenways, they may have relevance or, at least, provide some insights for other North Carolina communities.

A Recent History

Greenways were rediscovered in the 1980s. In the face of increasing public concern over the loss of open space and the protection of local quality of life, greenways emerged as a highly touted planning strategy (Little, 1987). A green-

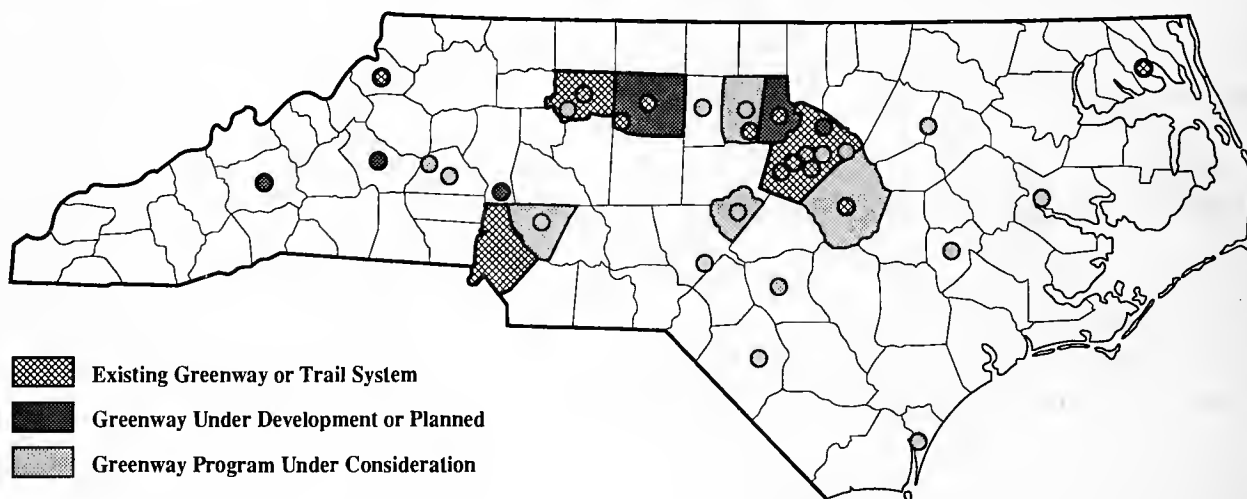
way may be defined as a narrow linear strip of undeveloped land often located along a stream, flood plain, powerline corridor or unused railroad line. Because they represent fingers of open, public space in a larger urban setting, greenways may provide a variety of public benefits. Specialized recreational opportunities, such as bike paths, jogging trails, or par courses, fit well into the greenway concept. At the same time, environmental and aesthetic goals may be enhanced by the maintenance of stream corridors, flood plains, and naturally vegetated areas (Kusler and Southworth, 1988). Nature study, fishing and picnicking are potentially important activities along greenways. Greenways may also be integrated into a local transportation system. Where greenways link neighborhoods and community facilities, they represent an alternative transportation mode to the roadway (Rotolo, 1981). Greenways are uniquely multifaceted facilities; they supply recreational, environmental quality, and transport services for a minimal public investment and occupy only a small portion of the community.

In the past ten years, the greenways concept has spread

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Greenway Programs in North Carolina



Source: Greenways Incorporated, *Current Status Greenways Programs in North Carolina*, February 1989.

from a few progressive communities, like Denver, Colorado and Portland, Oregon, to over 200 jurisdictions. (Knack and Searns, 1990). The highly regarded President's Commission on America's Outdoors recommended, in their 1987 report, the development of a locally based, nationwide system of greenways as a mechanism for providing public access to open space.

In North Carolina, there are eleven operating greenways or greenway systems, with an additional twenty-eight communities either in the process of developing greenways or considering them (see map above). Although most of the greenway activity in the state is concentrated in the more urban Piedmont, especially the Research Triangle area, greenways are found throughout the state in communities of varying sizes.

The Capital Area and McAlpine Greenways

While Raleigh and Charlotte's greenway planning programs have received widespread recognition, these efforts have produced very different products. In 1981, Mecklenburg County adopted a countywide master greenway plan calling for a 65-mile "green necklace" of linear open space linking communities and neighborhoods. The largest component of the greenway would be situated in lowlying floodplains. These water-oriented corridors would, in turn, be joined together using connecting trails along roadways (see illustration on page 39).

Presently, the only operating greenway section is the 350-acre McAlpine facility, extending along the McAlpine Creek. It is located in a middle- to upper-class suburban area in east Charlotte. Opened in 1979, greenway facilities

include three miles of paved bikeways, a three-mile cross-country running trail, and a three-acre lake. It adjoins the county-operated McAlpine District Park. The greenway abuts several neighborhoods and there are community entrances as well as the main entrance, with a shared parking area. The greenway, which has an estimated 5,000 visitors per week, is open daily without admission fee. Because it is a single-segment greenway, the McAlpine facility might be considered a neighborhood-oriented greenway.

The Capital Area Greenway, begun in 1972, is the oldest greenway in North Carolina and ranks among the largest municipal greenway systems in the United States (Flourney, Jr., 1989). The system serves the city of Raleigh and adjacent portions of Wake County, with 12 trail segments extending over 27 linear miles and covering 800 acres (see illustration on page 41). As the greenway winds through the city, it connects neighborhoods and communities of varying social and demographic characteristics.

Unlike the McAlpine greenway, the Capital Area greenway is a comprehensive system of trails, presenting easy opportunities for citizens throughout the city to use, due to its size and accessibility to many different neighborhoods.

Data Collection

The research data were collected at both greenways, over a one-month period, using an intercept survey. Greenway users at least sixteen years of age were randomly surveyed at different times of day. In Charlotte, the interviewers were positioned at the main and neighborhood entrances. In Raleigh, the interviewers divided their time equally among

four trails at main and various neighborhood entrances.

The four trails surveyed in Raleigh were the Shelley Lake, Johnson Lake, Buckeye, and Little Rock trails. These trails were chosen because they represent a cross-section of the various types of greenway trails and neighborhood settings for the Capital Area system. Upper middle-income neighborhoods surround the Johnson Lake Trail in southwest Raleigh. Upper middle-income and affluent neighborhoods surround the Shelley Lake Greenway Trail in northeast Raleigh.

The Buckeye and Little Rock trails are smaller greenways. The Little Rock Greenway in southeast Raleigh is situated in a predominantly low-income neighborhood. The Buckeye Trail runs through lower middle- to middle-income blue collar sections of east Raleigh with low-income housing developments situated near it.

The survey questionnaire was composed of multiple choice questions. It queried the respondents about greenway usage, visitors' concerns or problems, as well as collecting socioeconomic, demographic and locational information. Two hundred sixty-one adults completed the McAlpine questionnaire, while 320 persons answered the Capital

Area Greenway survey. The survey was designed to minimize interview time. The number of persons refusing to participate in the survey was extremely low, less than seven percent, in both cases.

Greenway Patrons

Given the locational and size differences between the Capital Area and McAlpine greenways, we began our research anticipating that there would be significant differences between greenway patronage in Raleigh and Charlotte. Surprisingly, we found that both the "comprehensive" and "neighborhood" greenways tended to draw a very similar user population and had the same service radius.

Tables 1 and 2 present a profile of greenway visitors in Charlotte and Raleigh. The majority of adult visitors in both communities are young to middle-aged, white, and reside in households without children. Socioeconomically, patrons are better educated and live in households with higher incomes than the average non-patron. When the McAlpine background variables are compared with the characteristics of the surrounding census tracts, and the Capital Area greenway background data are compared with citywide socioeconomic and demographic data, greenway users are found to be significantly younger, better educated, more affluent, and include fewer non-whites.

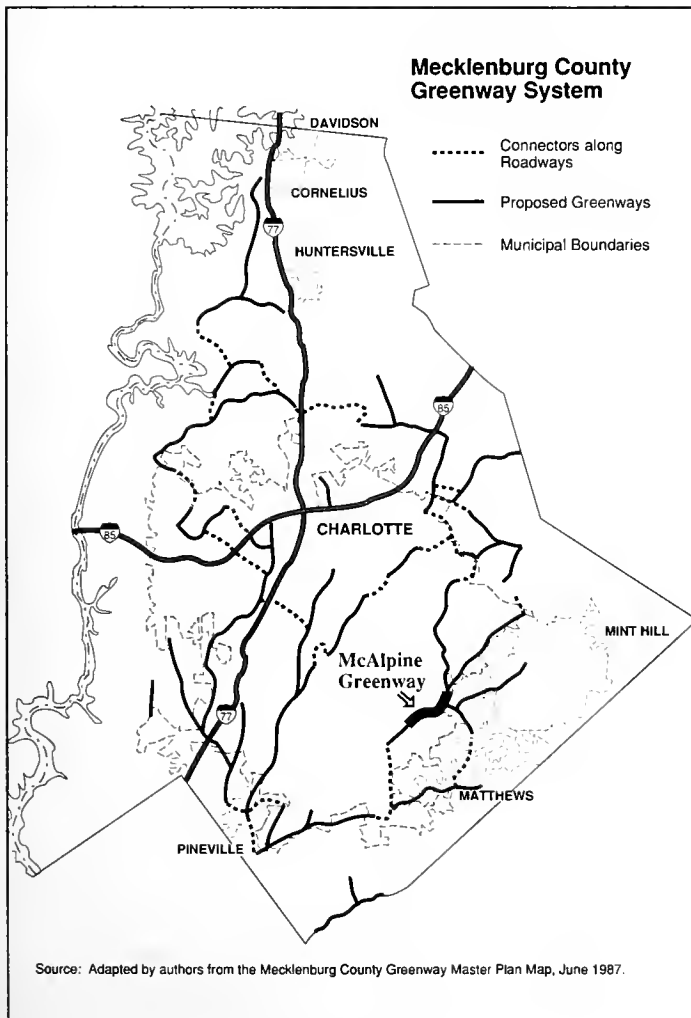


Table 1. Capital Area Greenway User Characteristics

Age	16-24 21%	25-34 33%	35-44 23%	45-54 13%	55-84 10%
Gender	Female 53%	Male 47%			
Race	Non-White 15%	White 85%			
Educational Attainment	High School Graduate 15%	Some College 24%	College Graduate 40%	Graduate Studies 21%	
Household Income	<\$10,000 7.6%	\$10,001-\$25,000 22.1%	\$25,001-\$50,000 42.2%	\$50,001-\$100,000 23.2%	>\$100,000 4.8%
Children <13 In Household	Yes 30%	No 70%			

One area where the Raleigh and Charlotte findings differ is gender. The majority of McAlpine visitors were men, whereas the largest number of respondents along the Capital Area Greenway were women. This variance might be accounted for by gender-related mobility differences. Transportation studies have shown that women tend to have less travel flexibility than men (Hanson and Hanson, 1981; Pas, 1984). Consequently, the larger, more accessible Capital Area greenway may provide greater opportunity for patronage by women than the McAlpine facilities.

Table 2. McAlpine Greenway User Characteristics

Age	18-24 15%	25-34 31%	35-44 25%	45-54 18%	55-64 7%	>65 4%
Gender	Female 48%	Male 52%				
Race	Non-White 5%	White 95%				
Educational Attainment	Not H.S. Graduate 3%	H.S. Graduate 13%	Some College 25%	College Graduate 45%	Graduate Studies 13%	
Household Income	<\$10,000 6%	\$10,000- \$25,000 24%	\$25,001- \$50,000 42%	\$50,001- \$100,000 22%	>\$100,000 5%	
Children <18 In Household	Yes 36%	No 64%				

Although the image of a "yuppie"-type greenway patron emerges from the user profile, this impression is tempered by frequency of use. While younger visitors predominate, they are not the most intensive users of these greenways. The heaviest greenway usage is by a smaller pool of older residents. When respondents were asked how often they used the greenway, the most active users were seniors, persons over 55 years. In Charlotte and Raleigh, a majority of the seniors interviewed visited the greenway daily. For most senior patrons, greenway activities have become an important part of their lifestyle.

The overwhelming majority of greenway visitors in both Raleigh and Charlotte live near the facility (see Tables 3 and 4). The primary service area of the four Capital Area greenway segments and the McAlpine greenway was a five-mile radius. Well over one-half (58%) of the Raleigh patrons live less than five miles from the greenway, and 90 percent reside less than ten miles from the trail on which they were surveyed. Similarly, 52 percent of the McAlpine visitors live within a five-mile radius and 91 percent live in a ten-mile radius.

Table 3. Capital Area Greenway Distance From User's Residence

Less than .99 miles	16.0%
1 to 1.99 miles	10.7%
2 to 4.99 miles	32.0%
5 to 10.99 miles	31.7%
Over 11 miles	9.6%

Table 4. McAlpine Greenway Distance From User's Residence

Less than 1 mile	18%
1 to 5 miles	52%
6 to 10 miles	21%
Over 10 miles	9%

The close correlation in travel distances between the McAlpine and Capital Area greenways was completely unexpected. Because the Capital Area Greenway offers the convenience of proximity to more neighborhoods, it was conversely anticipated that the McAlpine greenway would attract visitors from a much larger area.

The locational characteristics of patrons in both communities suggests that greenways play an important role in neighborhood recreation or activity patterns, but that they have much less importance in a regional context. The absence of large numbers of users living more than five miles from the greenways suggests that competing opportunities from other public facilities are meeting the needs of these potential visitors. In conclusion, persons are not willing to forego nearby recreational facilities in order to visit more distant greenways.

Patterns of Use

Greenways offer a variety of potential uses ranging from passive to active recreation, as well as transportation. This multi-faceted aspect of greenways is often cited by proponents as one of their most important selling points; however, when we queried Charlotte and Raleigh patrons about how they used the greenway, the respondents indicated a specialized pattern of use (see Tables 5 and 6).

Table 5. Capital Area Greenway Pattern Of Use

Activity	Everyday (%)	At least once a week (%)	At least once a month (%)	At least once a year (%)	Never (%)
Bike Riding	5.6	12.6	11.6	4.3	65.8
Walking	27.2	33.2	16.3	11.0	12.3
Jogging	8.3	17.3	10.0	3.7	60.8
Transportation	1.3	2.3	2.0	2.0	92.4
Bird Watching	4.7	6.6	8.0	3.0	77.7
Picnicking	0.0	3.7	15.3	16.6	64.5
Fishing	0.0	2.0	5.0	6.3	86.7
Boating	0.0	1.3	4.7	14.3	79.7

Table 6. McAlpine Greenway Pattern of Use

Activity	Very Frequently (%)	Frequently (%)	Seldom (%)	Never (%)
Walking	40	32	16	12
Jogging/Running	28	16	10	46
Bikeriding	8	16	16	60
Birdwatching	3	8	17	72
Picnicking	1	11	25	63
Transportation	2	4	8	86
Fishing	0	1	6	93

Based on our surveys, it would appear that the greenway is most used for walking, jogging or running, and bicycling. All other uses seem ancillary. Picnicking, bird watching, and fishing were regular greenway activities for a relatively small proportion of the greenway visitors. Among these

activities bird watching was the most popular, but only one in five Capital Area patrons and one in ten McAlpine patrons reported regularly visiting the greenway to bird watch.

The heavy use of the greenway for pedestrian- and bicycle-oriented recreation is perhaps not surprising. Their linear shape and separation from vehicular traffic make them an attractive alternative to streets or roadways. Very few urban land uses can provide these same conditions, which are so valued by pedestrian- and bike-oriented recreationists. Information about good places to recreate is often shared among runners, bicyclists and walkers, increasing usage by these groups.

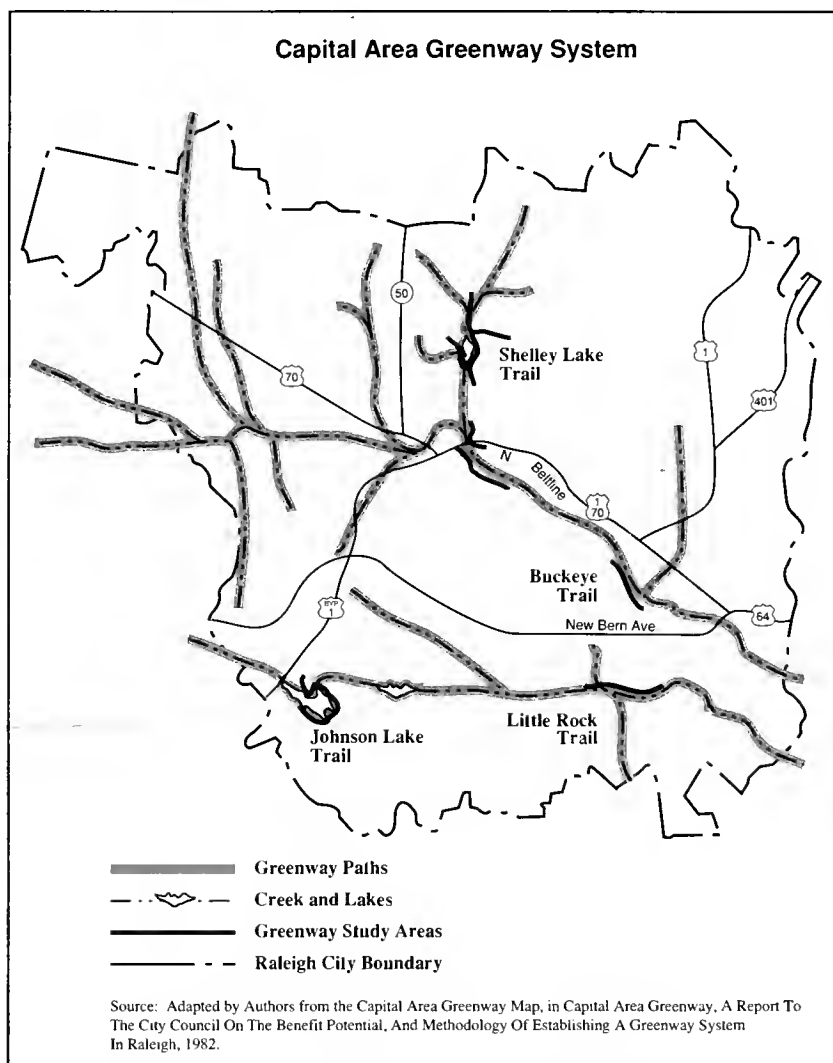
Additionally, greenway planners and managers tend to promote these facilities for these types of activities. In designing greenways, planners and landscape architects are keenly sensitive to pedestrian-related uses. Similarly, park and recreation managers have a tendency to market and operate these facilities with emphasis on walking, running, and biking. The lower usage rates for other types of recreation may be a reflection of a lack of awareness concerning other potential recreational activities in the greenways.

Among the lowest use categories on both greenways was transportation. Very few respondents, less than seven percent, stated that they regularly used the greenway for transportation purposes. This usage rate seems surprisingly low, in light of earlier national reports which emphasized the potential use of greenways for intra-city travel. This result underscores the fact that neither greenway was specifically planned for transportation purposes. The McAlpine greenway is only three miles long, and its present end points are two highway bridges. The Capital Area greenway is extensive, but it also was not planned to connect activity points (e.g., employment centers, shopping areas, community facilities). Lacking accessibility to city-wide travel destinations, extensive use of either greenway for transport is unrealistic.

A second consideration may be the survey population, which was limited to adults. Because both greenways provide linkages between neighborhoods their greatest transportation use is likely to be inter-neighborhood or neighborhood-to-park. Much of this type of local travel would be by youths visiting friends in nearby neighborhoods or going to the park. Had we surveyed all greenway patrons, the youthful visitors might have increased the travel element.

Patron Satisfaction and Concerns

One area where user surveys provide insights that cannot be collected through any other mechanism is visitor satis-



faction. Without these data it is impossible to know how effectively a facility or specific design is meeting public needs and expectations. Moreover, one is able to identify user problems and measure the seriousness of these concerns. This type of information can be used to modify existing greenway structures or operations to respond better to public needs, as well as to plan and design more "user friendly" greenways in the future.

Our survey found that both Capital Area and McAlpine greenway visitors were extremely satisfied. Admittedly, we expected greenway visitors to be supportive of greenways, or they probably would not use the facility; however, their enthusiasm for local greenways and greenway expansion was more intense than anticipated.

When respondents were asked to rank the importance of greenways against other types of parks, greenways were perceived more valuable by a majority of the Raleigh patrons and slightly less than a majority of the Charlotte patrons (see Table 7). Clearly, greenway users find these facilities better suited to their recreational needs than traditional parks.

Table 7. Patrons' Attitudes Toward Local Greenways

"Compared to other types of parks, how would you rank the importance of greenways?"				
	<i>More Valuable (%)</i>	<i>Equally Valuable (%)</i>	<i>Less Valuable (%)</i>	
Capital Area	62.8	34.9	2.3	
McAlpine	48.0	50.0	2.0	

"Would you support spending public money to develop and operate additional greenways?"			
	<i>Yes (%)</i>	<i>No (%)</i>	<i>Don't Know (%)</i>
Capital Area	89.8	2.3	7.9
McAlpine	90.0	5.0	5.0

"How likely would you be to support raising property taxes to develop more greenways?"				
	<i>Very Likely (%)</i>	<i>Likely (%)</i>	<i>Don't Know (%)</i>	<i>Very Unlikely (%)</i>
Capital Area	23.3	29.2	21.9	10.3

"Even if it meant raising taxes would you support developing more greenways?"			
	<i>Yes (%)</i>	<i>No (%)</i>	<i>Don't Know (%)</i>
McAlpine	73.0	14.0	13.0

A willingness to spend public funds, or even increase taxes to expand greenways, would indicate a deeper support not measured by the first general question. When queried about increased public spending, roughly 90 percent of the patrons responded affirmatively. But if increased greenway spending were translated into higher taxes, the survey showed that the amount of support would drop. Nevertheless, a majority of the users, 73 percent in Charlotte and 52.5 percent in Raleigh, indicated support for greenway expansion even with higher taxes.

Patron support and satisfaction with their greenways was also evident when respondents were asked about greenway problems (see Table 8). The survey listed several potential problems and asked respondents to indicate whether each problem was "very serious," "serious," "minor" or "no problem." The set of problems was compiled in conjunction with the North Carolina Greenways Conference Organizing Committee to cover a wide range of user concerns.

A review of these survey results shows that most Raleigh and Charlotte greenway users indicated very few problems with their facilities. No more than seven percent of the McAlpine users or fifteen percent of the Capital Area users classified any problem as "serious" and "very serious." On every issue a majority of the respondents indicated "no problem." This perception was completely unexpected.

Based on our discussions with greenway planners, we had expected to find that "security or fear of crime" would be a widespread user concern, but it proved to be much less of a problem than anticipated. Among Capital Area Greenway users, 58.8 percent described it as "no problem," while 75 percent of McAlpine users described security as "no problem." Moreover, among those surveyed who did indicate a concern about crime or security, most considered it to be a minor issue.

Greenway cleanliness, parking limitations, and crowding were somewhat problematic among Raleigh patrons, while area limitations causing overuse and crowding were issues among Charlotteans. In both communities it seems that greenway users have some anxiety about approaching greenway carrying capacity. Some of this concern may have been reflected in the earlier discussions about providing public money to expand the greenways.

The quality of greenways and their condition were minor issues to our respondents. In line with earlier findings, poor facilities, maintenance problems and insufficient staffing were rarely considered problems to the survey participants.

Conclusions

The survey results indicate that Raleigh and Charlotte greenway users are heavily drawn from surrounding neighborhoods or communities. There is a clear distance-decay function associated with visitation, with the largest number of visitors living close to the greenway where they were surveyed and the number of visitors declining as home-to-greenway distance increased. The service radius in both cities was approximately five miles. The notion that individual greenways or greenway segments act as community-



For most senior patrons, greenway activities are an important part of their lifestyle.

Table 8. Greenway Patrons' Problems And Concerns

	Capital Area Greenway				McAlpine Greenway			
	Very Serious Problem (%)	Serious Problem (%)	Minor Problem (%)	No Problem (%)	Very Serious Problem (%)	Serious Problem (%)	Minor Problem (%)	No Problem (%)
Security/ Fear of Crime	4.7	10.6	25.9	58.8	1	5	19	75
Too Small/ Limited Area	1.0	7.6	12.6	78.7	1	6	20	73
Cleanliness	4.7	8.3	23.3	63.8	0	1	16	83
Crowding	2.0	6.6	22.6	68.8	0	3	20	77
Limited Parking	1.7	13.3	20.9	64.1	-	-	-	-
Inadequate Facilities	2.0	7.3	14.6	76.1	-	-	-	-
Facility in Disrepair	0.3	3.7	15.0	81.1	0	0	10	89
Poor Facilities	0.3	1.3	8.3	90.0	0	4	11	85
Inadequate Staff	-	-	-	-	0	2	13	85

cited by a minority of patrons as considerations, they are relatively unimportant. The message to planners and managers seems to be that existing planning and design efforts have been well received by greenway patrons. The challenge facing planners is to develop strategies to avoid perceived overcrowding and resource degradation (either social or environmental) in the future. Increased patronage and new types of usage could adversely affect user satisfaction. The most obvious solution is to expand systems and spread out users and their activities. If monies cannot be found for greenway expansion, the challenge will be more troublesome.

In a very short time, Raleigh, Charlotte, and other commu-

nities have made enormous progress reviving the greenway concept and implementing community-wide greenway systems.

Their accomplishments, as indicated by our research, have been impressive. As more communities across North Carolina initiate new greenway programs, they can learn a great deal from the experiences of the Capital Area and McAlpine Greenways. □

wide recreational resources is not supported by our data. Similarly, the study sites were patronized by a particular subpopulation of the local area. These visitors used the facility intensively for selected types of activities. The profile of the average greenway user was a young to middle-aged, white upper middle class person. Seniors, however, used the greenways most frequently.

While both greenways offered a variety of potential recreation and transportation opportunities, most of those surveyed limited themselves to walking and biking. For our respondents, greenways provide a recreational niche designed for these forms of exercise. One lesson for planners and managers may be to either accept the current perceptions and design and operate their greenways accordingly, or, alternatively, to market the greenway as a broader public resource. The latter option would require greater efforts to structure new programs and activities which are not pedestrian- or bike-related, to attract other user populations.

The use of greenways as viable transportation modes for intra-city adult travel has also not developed in Raleigh. It is important to recognize that if greenways are to function as transportation elements, then greater attention needs to be given to integrating them into transportation planning programs.

Finally, our surveys indicated that the existing greenway user is a very contented patron, with strong political support for greenways and greenway expansion. For patrons there is no single issue which represents a significant problem. Although crime and carrying capacity questions are

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The Effects of Global Warming and Sea-Level Rise on Coastal North Carolina

R. Paul Wilms

Sea-level rise due to global warming is certain to cause significant changes in the world's coastlines. North Carolina, with 300 miles of open shoreline and 1700 miles of estuarine shoreline, will be one of the areas greatly affected by rising sea level. This article discusses the potential effects and policy implications of sea-level rise on coastal North Carolina.

Introduction

Increasing concentrations of greenhouse gases, principally carbon dioxide (CO₂), are certain to alter not only North Carolina's climate, but its physiography, ecology, and economy as well. Nowhere will the effects of global climate change be more pronounced than in coastal North Carolina.

In the last 180 years, global CO₂ concentrations have increased 20 percent, from between 260 and 290 parts per million (ppm) to 340 ppm, and 8 percent since 1958 alone (NRC, 1983). A doubling of atmospheric CO₂ concentrations is not only possible, but expected. Atmospheric levels of other greenhouse gases have increased as well. Methane increased 1 to 2 percent per year from 1970 to 1980, chlorofluorocarbons by about 0.6 percent over that same decade, and nitrous oxide by about 0.2 percent from 1975 to 1980 (WMO, 1982).

Global mean temperatures have increased 0.6°C over just the last century, consistent with atmospheric CO₂ increases over that period, and are expected to rise by no less than 1.5°C and perhaps by as much as 4.5°C by the year 2030 due to a doubling of atmospheric CO₂ concentrations alone (Charney, 1979). Increasing concentrations of other greenhouse gases could double the warming expected from increasing CO₂ concentrations (WMO, et al., 1982). Dr. James Hansen, director of the Goddard Institute for Space Studies, predicts that if current CO₂ levels double, the number of days per year with temperatures above 32.2°C (90°F) for representative U.S. cities will increase, as shown in Table 1.

In North Carolina, a doubling of global atmospheric CO₂ concentrations would result in Raleigh's having an annual mean temperature of 19.2°C, greater than that of Dallas, Texas, today. Wilmington at 21.4°C would be as warm as Phoenix, Arizona, is now, and Charlotte would have an annual mean temperature of 19.6°C, approxi-

Table 1. Days Per Year with Temperature Greater Than 90°F

City	Average 1950-1980	Projected Average With Doubled CO ₂
Washington, D.C.	36	87
Omaha	37	86
New York	15	48
Chicago	16	56
Denver	33	86
Los Angeles	5	27
Dallas	100	162
Memphis	65	145

Source: J. Hansen, 1987

mately that of Jacksonville, Florida. Asheville would have an annual mean temperature of 17°C, fully 1°C higher than that of Mexico City, Mexico, today.

Increased global mean temperatures by themselves could engender a broad range of environmental and climatological impacts. Warmer temperatures in combination with increased concentrations of nitrogen oxides and hydrocarbons and enhanced ultraviolet radiation could result in elevated ozone levels, consequently increasing photochemical smog and related mortality and morbidity in urban areas. Temperate zone forests, already degrading due to air pollution, could be further stressed as increased temperatures accelerate the mechanisms causing the degradation. This forest degradation may, in turn, exacerbate eutrophication and acidification of downstream fresh waters. Agricultural production may be affected as well, with crop yields reduced a net 5 percent for every one degree centigrade rise

R. Paul Wilms was director of the North Carolina Division of Environmental Management from 1985 to 1989.

in annual mean temperature (Dudek, 1987).

Potentially, the most devastating greenhouse effect will be the increased rate of sea-level rise due to thermal expansion of the ocean and more rapid melting of alpine, Antarctic, and Greenland glaciers. Various projections of sea-level rise and the relative contribution of the most significant sources to that sea-level rise due to a doubling of CO₂ levels (and the consequent increase in atmospheric and ocean temperature) are shown in Table 2.

Table 2. Projections of Sea-Level Rise Due to a Doubling of CO₂ Levels (In Centimeters)

Author	Thermal Expansion	Alpine Glaciers	Greenland Glaciers	Antarctic Glaciers	Total
Revelle (1983)	30	12	12	*	70
Meier (1984)	-	10-30	-	-	-
Bindschadler (1985)	-	-	10-30	-	-
Hoffman, et al. (1986)	28-83	12-37	6-27	12-220	57-368
Thomas (1985)	-	-	-	0-220	-
Hoffman, et al. (1983)	28-115	\$	\$	\$	56-345
NRC (1983)	-	10-30	10-30	-10-+100	-

* 16 centimeters due to sources other than doubling of CO₂

\$ glacial contribution assumed to be one to two times the contribution of thermal expansion

The general consensus is that a sea-level rise of 50-200 centimeters (1.6-6.6 feet) will occur over the next century. The U.S. Environmental Protection Agency estimates that a global sea-level rise of between 4 and 7 feet is likely by the year 2100 and may be as high as 11 feet (Hoffman, et al., 1983). Although there is substantial local variability and statistical uncertainty, average sea level over the past century has already risen approximately 30 centimeters relative to the coast of North Carolina (NRC, 1987). Accordingly, a sea-level rise in North Carolina of 5 feet by the year 2100 was selected as supportable for the purposes of this study.

Physical Impacts of Sea-Level Rise on Coastal North Carolina

As sea level rises, shoreline retreat, flooding, and saltwater intrusion will increase. The magnitude of these effects and their environmental, social, and economic implications is a function of the physiography, topography, and population density of the areas impacted. By any method of accounting, the impacts of sea-level rise on North Carolina will be significant. Eastern North Carolina is characterized by over 300 miles of open ocean coastline and over 1700 miles of estuarine shoreline. Although the topography of the twenty-two coastal counties included in this study is highly variable, much of the area is low and swampy. Elevations on the barrier islands range from a few feet above mean sea level (msl) to 100 feet above msl for isolated hills,

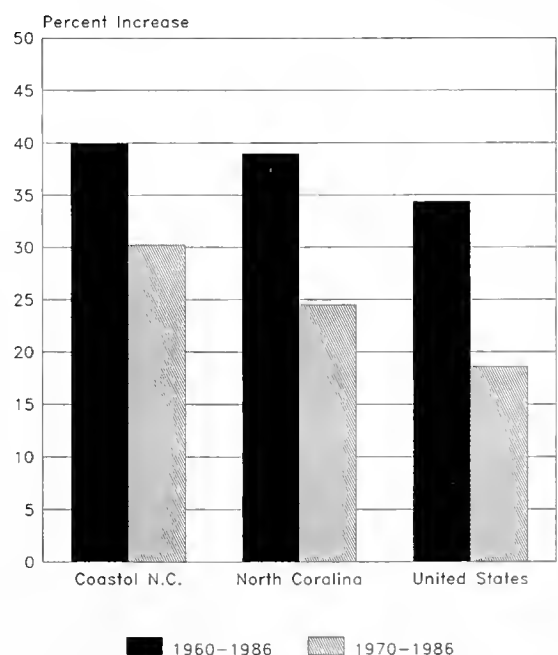
with many areas subject to overwash by storm surges. On the mainland, much of the area is lower than 20 feet above msl with a large percentage less than 5 feet above msl.

As Figure 1 shows, the permanent resident population of the coastal counties of North Carolina has increased dramatically since 1960. From 1960 to 1986, the populations of the United States and North Carolina have increased 34.4 percent and 39.0 percent, respectively, while the population of the twenty-two coastal counties increased 40.0 percent. From 1970 to 1986, the difference in relative population growth rates is even greater, only 18.6 percent and 24.5 percent for the United States and North Carolina, respectively, compared to 30.2 percent for the twenty-two coastal counties.

The increase in population in the twenty-two coastal counties has occurred primarily at or near the coastline, thus significantly increasing the population impacted by rising sea levels.

Given these geographic and demographic characteristics of coastal North Carolina, a five-foot rise in sea level could cause significant environmental, social, and economic impacts. Shorelines will retreat because lowlands will be inundated and land adjacent to the advancing sea will erode. May, et al., (1983) estimates that the average shoreline erosion rate in North Carolina over the past 40 to 50 years has been about 60 centimeters per year. In North Carolina, as well as along much of the Atlantic and Gulf Coasts of the United States, a 30-centimeter (1-foot) rise in

Figure 1. Population Growth Rate



Source: U.S. Department of Commerce

sea level would erode sandy beaches at least 30 meters (100 feet) and, perhaps, as much as 300 meters (1000 feet) (Hoffman, et al., 1983); therefore, a sea-level increase of 5 feet would result in a shoreward erosion of 500 to 5000 feet and would dramatically alter shoreline configuration.

A simple drowned-valley concept, in which preexisting topography along shorelines is considered fixed, can be utilized to conservatively model the resulting shoreline configuration as a function of sea-level rise (Kana, et al., 1984). The illustration to the right shows the changes in North Carolina's shoreline as a result of a five-foot rise in sea level using this model. Although the model is simplistic and does not account for the landward migration of barrier islands, it does serve to depict the dramatic implications of a five-foot rise in sea level. Utilizing the drowned-valley concept reveals that a five-foot rise in sea level would inundate over 1.23 million acres of lowlands, swamps, and marsh in North Carolina, ranging from just over 6000 acres in Chowan County to more than 260,000 acres in Hyde County. Nearly 73 percent of the total acres lost to inundation will occur in six of the twenty-two coastal counties (see Figure 2).

A five-foot rise in sea level would inundate 87 percent of Dare County, 75 percent of Tyrrell County, more than 66 percent of Hyde County, over half of Currituck County, and significant portions of many others (see Figure 3).

Lowlands not inundated will experience more frequent and severe flooding. Higher sea levels will engender larger storm surges and, because of beach erosion and deeper water, larger waves may impact further inland.

Much of the area subject to inundation by a five-foot sea-level rise is currently wetlands, including back-barrier marshes, estuarine marshes, and tidal freshwater marshes. Wetlands are vital to coastal recreation, to commercial fishing, to the maintenance of water quality, and as a buffer against shore erosion. The amount of wetland loss due to rising sea levels is highly speculative. Shoreline erosion will likely account for less than 1 percent of the marsh loss due to rising sea level because most marshes will have been long since inundated before erosion can take place (NRC, 1987).

A far greater cause of wetland loss due to rising sea level will be direct inundation and the formation of vast interior ponds resulting from tidal creek bank erosion and landward growth as the areas affected by tides expand. The amount of marsh loss due to anoxia and ultimate root death of marsh plants as rising sea levels outpace the ability of the marsh to maintain elevation could be catastrophic.

Rising sea level will also increase saltwater intrusion into groundwater, rivers, and estuaries. It is estimated that the salt-

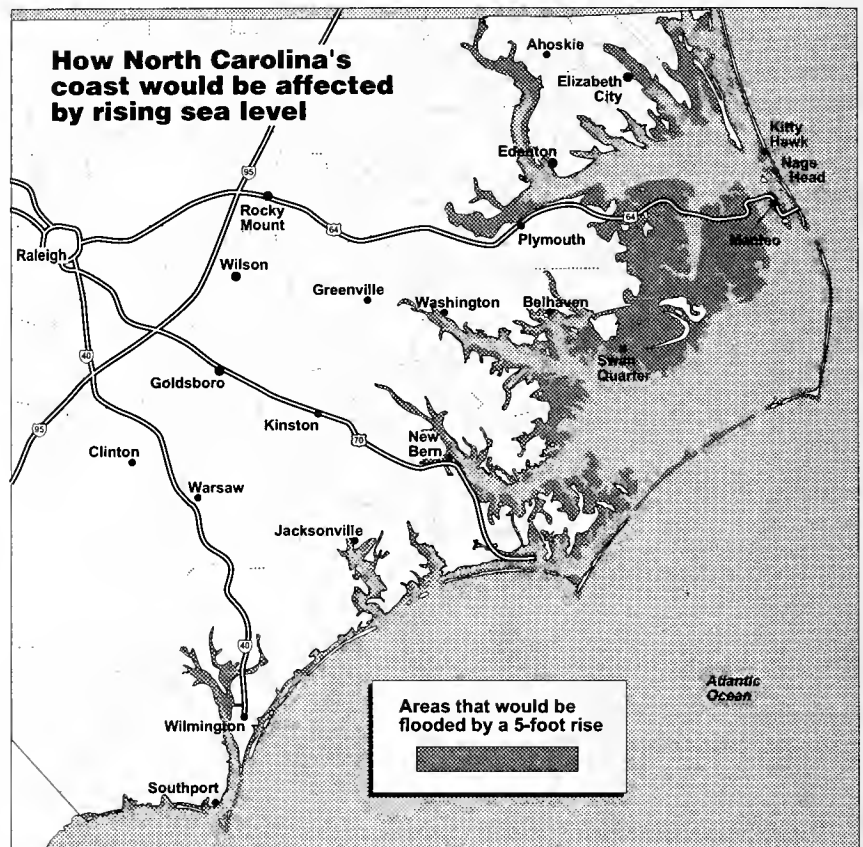


Figure 2. Percent of Total Area Inundated Per County

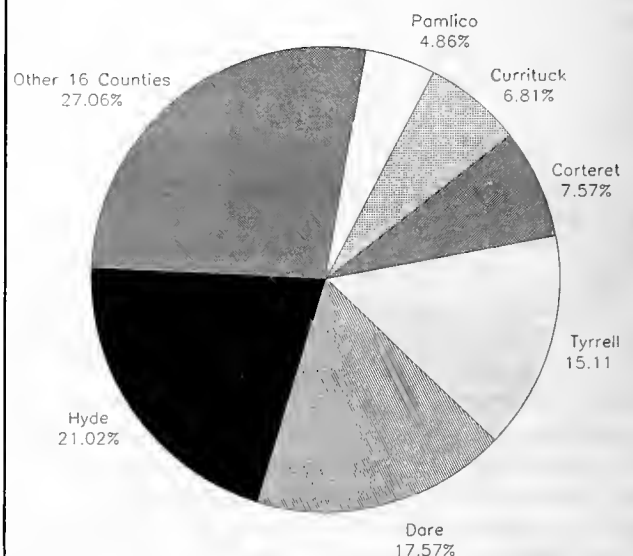
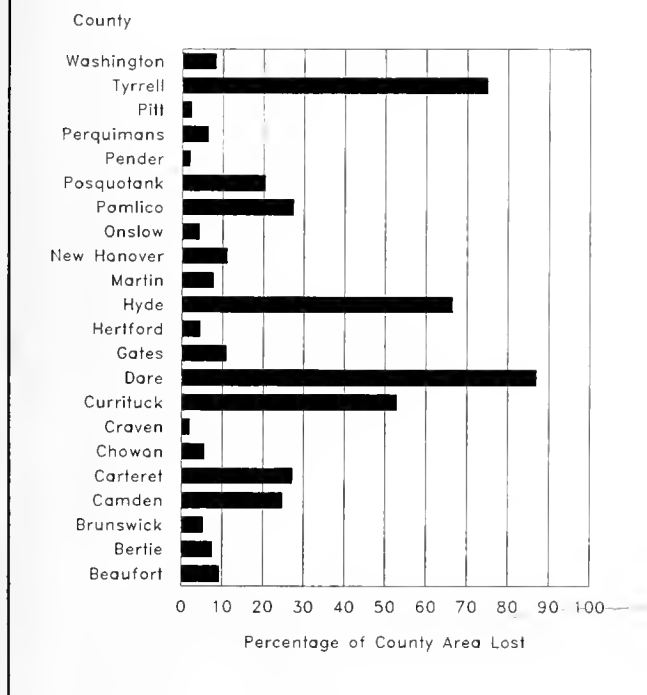


Figure 3. Area Inundated by a Five-Foot Rise in Sea Level

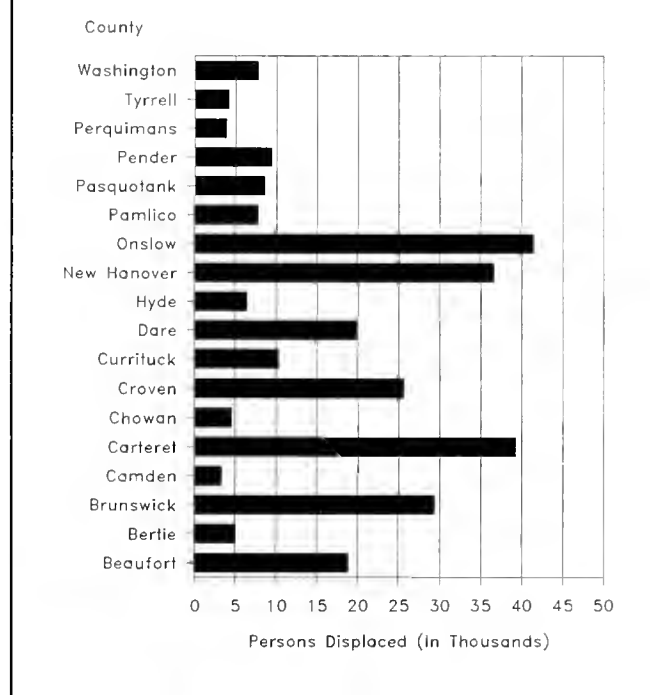


water wedge through estuaries and tidal rivers could advance as much as 1 kilometer for every 10 centimeter rise in sea level (NRC, 1987); therefore, a five-foot sea-level rise could push the saltwater wedge almost 10 miles further upstream, posing significant threats to local water supplies and freshwater ecosystems. Evidence of this saltwater-wedge migration due to sea-level rise may already be available. In its report entitled "Salinity and Bald Cypress (*Taxodium distichum*)," the North Carolina Division of Environmental Management cites a study by Hackney and Yelverton attributing the decline of an extensive area of cypress and gum trees along the lower Cape Fear River to increasing salinity or tidal flooding associated with sea-level rise and channel dredging at the mouth of the river (DEM, 1987). Many forested wetlands in the lower portion of the river have already been converted to brackish marsh. Hackney and Yelverton (1987) believe that the process of cypress decline and marsh replacement will continue as sea level rises.

Economic and Social Impacts of Sea-Level Rise on Coastal North Carolina

Because humans seem to have a predilection for building on or as near to water as possible, perhaps the predominant impact of sea-level rise will be on man's cultural establishment rather than on the natural environment, especially given the dramatic increase in population at and near the

Figure 4. Population Displaced by a Five-Foot Rise in Sea Level



coast. Using the average assessed value per acre for each of the twenty-two coastal counties, the value of the 1.24 million acres inundated by a five-foot sea-level rise can be conservatively estimated to be approximately \$1.86 billion. Utilizing data developed by the N.C. Division of Emergency Management, et al. (1987), it is estimated that a five-foot rise in sea level would displace more than 282,000 permanent residents in eighteen of the twenty-two coastal counties (see Figure 4), or about 44 percent of the 1986 coastal population for those eighteen counties.

Public Policy Options in Response to Sea-Level Rise

Given the potential economic impact and social disruption attendant to a five-foot sea-level rise, one can anticipate that man's response to this phenomenon will be aimed at protecting what has already been built. Consequently, the environmental impacts of man's response to sea-level rise could be greater than the impacts of sea-level rise itself. It must be remembered that the coastal ecosystem is in a natural, dynamic equilibrium. As sea level rises, erosion will attempt to restore that equilibrium. If left unimpeded, sandy beaches will move landward, and marshes and wetlands will be reestablished further inland. Marshes and wetlands will be reestablished at a slower rate than they are destroyed by rising sea level, however, and will be less extensive. Of course, these natural processes will not be left

unimpeded. Existing cities, harbors, highways, and other infrastructure, including erosion-control structures, already pose significant physical barriers to this natural restoration of the equilibrium and, given the potential societal impacts, natural restoration would not be socially or politically acceptable.

In general, the two options available in response to sea-level rise are protection, either by beach nourishment or by coastal armoring, or retreat. The coastline of The Netherlands testifies to the fact that it is technically possible to protect areas against sea-level rise; however, once a strategy involving diking, drainage, and artificial shoreline stabilization through beach nourishment or construction of dams, groins, sea walls, and the like is adopted, vested interests will demand its continuation regardless of the cost. By any standards, these costs, in either economic or environmental terms, will not be trivial. Diking and embankment, while relatively simple processes, can themselves cause profound environmental changes and can entail many, usually undesirable, hydrologic and morphologic effects. Drainage canals must be constructed and, because the beneficial effects of flooding are lost, irrigation facilities may have to be provided. Additionally, natural tidal drainage systems will have to be replaced by lift pump drainage. Hydraulic loading on coastal structures such as breakwaters, bridges, and water intakes/outlets will be increased by rising sea levels, requiring that such facilities be reinforced or adjusted. Adding to this concern is the prospect of overtopping and erosion of solid-waste landfills, waste pits, lagoons, and disposal sites in low-lying areas, which will enhance leaching of pollutants from such facilities into surrounding surface and ground waters.

While the spectre of widespread bulkheading, damming, diking, and pumping is truly fearsome, structural protection is almost always technically possible and, in the short term, even necessary; however, in those areas where the long term cost of protection or the environmental damage engendered by it is unacceptable, retreat from the shore will be advisable. Retreat, which will occur either gradually in keeping with some orderly plan or catastrophically as a result of coastal storms, can be accomplished (1) by moving buildings as the shoreline advances, (2) by allowing buildings to be destroyed by storms and the debris removed, or (3) by precluding the construction of buildings near the shoreline in the first place. North Carolina's moving setback requirement for construction projects on the beach based on annual erosion rates is a technically simplistic, but politically progressive, example of the latter. In addition to the anticipatory land-use planning inherent in North Carolina's construction setback requirement, Howard, et al. (1985), recommend that the retreat option also include a cessation of shoreline stabilization efforts and removal of coastal stabilization structures that threaten public safety as well as structures undermined by the sea.

The decision of whether to retreat or protect will neces-

sarily be based on many factors, not the least of which should be the impacts of one particular community's selected strategy on neighboring communities. In the final analysis, however, intense emotionalism, parochial politics, and false economics can be expected to drive the decision making process.

Recommended Actions

Need North Carolina do anything in light of the projected rise in sea level? Can anything be done? The answer to these questions is a resounding yes, but the timing of the state's response will in large part determine its effectiveness. In the short term, North Carolinians will be confronted with the classic dilemma of having to make decisions in the face of awesome uncertainties. The dilemma is this: Should the state take actions now at the risk of incurring economic costs that might later prove to have been unnecessary, or should the state wait for more conclusive information, thereby running the risk that any actions taken later, if still possible at all, will be more costly? Certainly, extremism must be avoided, but so too must delay in policy development. The risk of waiting to form policy until there is complete scientific certainty may be too great and, at the very least, may preclude some policy options that otherwise would have been available.

History shows that decision makers for the most part react only to discrete, clearly recognizable events and rarely to slow cumulative developments. In the case of sea-level rise, reticence on the part of decision makers will be understandable, since any selected strategy, ranging from full protection to full retreat, will have significant and widespread environmental, social, and economic impacts. Marshalling public support for the selected strategy will be difficult, since many of the effects of global climate change will not be clearly evident to society as a whole for at least several years. In fact, the first and perhaps one of the greatest challenges facing policy makers and scientists is to sensitize people to what is occurring and to the difficult choices that must be made.

North Carolina will experience many of the projected impacts associated with global climatic change, for example, impacts on agriculture, forestry, water and air quality, and coastal infrastructure and ecosystems. Accordingly, North Carolina has the responsibility and the opportunity to exercise national leadership in dealing with these phenomena. At a minimum, the state can and should take the following actions:

1. Initiate a risk assessment program to determine the sensitivity of North Carolina ecosystems, agriculture, silviculture, and infrastructure to a wide range of potential climatic changes. This program would include a survey of coastal topography to define those areas most vulnerable to sea-level rise.
2. Enhance research and monitoring of the state's climate.

3. Require development in North Carolina's coastal areas to take into consideration the predicted rise in sea level:
 - a. Allow building next to a marsh and anywhere below the five-foot elevation only with the understanding that if sea level goes up, buildings must be moved. This approach would overcome constitutional questions regarding unlawful taking of property and, if sea level did not rise, would avoid costs of overreaction. North Carolina currently does not allow building in the marsh, but construction immediately adjacent to the marsh is permitted; therefore, as sea levels rise, inundated marshes would not be replaced.
 - b. Require all project proposals on the coast to consider the various sea-level rise projections and specify what will be done pursuant to each of the projections.
 - c. For those coastal projects requiring an Environmental Impact Statement (EIS), require the EIS to consider the implications of sea-level rise.
 - d. Give priority for clean-up to those hazardous waste sites subject to sea-level rise.
4. Assess the environmental, economic, and social implications of climate change in North Carolina and formulate mitigation policy options that are periodically reviewed and updated.
5. Diagnose and periodically reassess the economic, social, and political disruption likely to be caused by the effects of global climate changes, particularly sea-level rise, in North Carolina, and make preparations to mitigate them. Gubernatorial veto authority may be necessary to ensure an adequate and effective response to the implications of global climate change from a coordinated, statewide perspective and as a defense against the plethora of local legislation, aimed at parochial needs, which will be competing for limited resources.

These recommendations, while necessary, are admittedly defensive and reactionary, aimed at addressing the symptoms of climate change, particularly global warming. A concomitant, proactive response to global warming is not only possible but, in the long term, essential. Ultimately, emissions of CO₂ must be reduced through (1) a sustained energy conservation program, (2) a gradual transition from fossil-fuel generation of electricity to alternative sources of energy, including invigoration of the nuclear power industry, and (3) a reduction in, if not an end to, global deforestation. It is unlikely that any measures taken now will reduce the global warming expected within the next few decades; however, whatever steps can be taken to limit global warming should be effected as quickly as possible, if for no other reason than to slow the rate of global warming to provide additional time to study the issues, and thereby make better informed decisions. □

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Downtown Revitalization and Historic Preservation in Small Town America: A Case Study of Tarboro, North Carolina

E. Watson Brown
Wes Hankins

Tarboro, a small town of 11,000 in eastern North Carolina, was incorporated in 1760 and possesses a rich heritage. In recent years, however, Tarboro has struggled to overcome economic decline and create new opportunities for growth and development. This article describes Tarboro's efforts, focusing on the town's creative combination of downtown revitalization and historic preservation with economic development.

Tarboro's economic decline reached new heights in the 1960s and early 1970s. New industries stopped locating in the town; stores closed on Main Street; older neighborhoods became less fashionable and showed obvious signs of decay. The very fabric of the town was weakening as the young moved away, leaving Tarboro for the opportunities of larger cities.

The year 1974 was a turning point. In that year, Tarboro was notified by the U.S. Department of Housing and Urban Development (HUD) of its participation in the new Community Development Block Grant (CDBG) program. The town then hired a town planner to work with community leaders and citizen groups to formulate plans for the redevelopment of Tarboro.

A set of action plans was drafted to channel funds toward numerous projects. These plans focused on the rehabilitation of older neighborhoods surrounding downtown Tarboro and the revitalization of the downtown itself. The philosophy was simple: the renaissance of downtown neighborhoods would help spur the rebirth of the downtown commercial area. This process recognized the need for more information, and the following studies were commissioned:

- Land use plans and specific action plans were developed and implemented with the assistance of undergraduate classes and interns from the Urban and Regional Planning Program at East Carolina University.
- *Tarboro Historic District Study*, developed with the assistance of a graduate class from the Department of City and Regional Planning at UNC-Chapel Hill, recommended policies and regulations for an historic neighborhood on two sides of downtown.
- *Tarboro, North Carolina: A Design Development Plan*, developed by a graduate class from the School of Design at N.C. State University, included urban design guide-

lines and specific renovation proposals for the historic commercial core.

- *Commercial Market Analysis: Tarboro, North Carolina*, conducted by Zuchelli, Hunter, and Associates of Annapolis, Maryland, studied Tarboro's economy and helped the town in making economic development decisions.

These studies and reports stressed that Tarboro should:

- Focus efforts on preserving the town's numerous historic sites and districts.
- Improve marketing efforts to increase awareness of Tarboro's history and unique resources.
- Capitalize on the town's central location surrounded by larger cities. Tarboro's size and location had been viewed as a negative factor, due to out-migration of retail dollars, but it could become a positive element, with Tarboro serving as a special hub in the region.
- Seek to attract small, specialty stores rather than large, regional, or national retail chains.
- Target economic development efforts not only on industrial recruitment, but also on residential development. Due to its central location near larger cities, Tarboro could become a bedroom community.

E. Watson Brown, hired in 1974 as Tarboro's first town planner, served in that position until 1985. He received a master's degree in planning from the University of North Carolina at Chapel Hill in 1974. He is currently senior planner in charge of comprehensive planning for the city of Raleigh.

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- View additional residential development in and around downtown as a key to stabilizing the commercial core.

Funding

With these plans and special studies completed, the town began the task of finding money to implement the recommended projects. Over a ten-year period, Tarboro was able to generate over \$30 million for the revitalization of downtown neighborhoods and the commercial core. Funding sources included private citizens, local businesses and industries, local and national foundations, and state and federal agencies such as HUD, the U.S. Department of the Interior, the Bureau of Outdoor Recreation, the N.C. Housing Finance Agency, and the N.C. Department of Natural Resources and Community Development.

Neighborhood Preservation

The Tarboro Historic District was established in 1976. This overlay zoning district regulates all exterior property alterations in a 45-block area on two sides of downtown. The designation of a historic district accomplished many things: it increased public awareness of Tarboro's history; it provided a distinct neighborhood image and pride; it helped to stabilize and even increase property values; and it established a definable area for both public and private rehabilitation investments and public improvements. Since the creation of the district in 1976, the following have occurred:

- *Rehabilitation and Restoration.* Numerous architecturally significant homes were restored privately, and over forty renovations were performed through public incentive programs offering low-interest loans and grants. The availability of grants to low- and moderate-income residents preserved the neighborhood income mix and forestalled the gentrification that has occurred in other historic districts. Historic rehabilitations extended into adjacent minority neighborhoods, where several houses significant to local black history were restored.
- *Public Improvements.* Public improvements, including resurfaced streets, improved drainage systems, and better sidewalks, were made without disturbing trees and other significant neighborhood features. New sidewalks were tinted to blend with older walkways, and two streets were redesigned so that traffic islands protected older trees. New street lights placed in several areas of town are replicas of the 1920s art deco lamps that line Main Street, and new street identification signs match older signs. These improvements were

costly, but they respect the character of the district and make it a more desirable residential area.

- *Landscaping.* A landscaping and tree-planting program, in effect throughout the town for fifteen years, planted thousands of street trees and established a routine maintenance program to care for older trees. The town has a full-time horticulturist to design and oversee landscaping programs. The Town Common, a 25-acre open space set aside by the founding fathers in 1760, is carefully maintained and has become one of the most significant historic open spaces in the South. At the western end of the Town Common, the restoration of an 1850s Cotton Press created an additional focus area for tourists. The town of Tarboro, working with a local garden club, landscaped a neglected ravine adjacent to the Cotton Press as a nature trail. The resulting McBryde Trail and herb garden won a national award given by the U.S. Association of Garden Clubs in 1981.
- *Focus on Tourism.* With plans identifying tourism as a potential industry for Tarboro, public relations became a function of the town planning department, which published brochures, placed advertisements in regional and national publications, and put Historic Tarboro on state road maps and other tourist literature. This additional publicity has led to regional recognition and new investments. Numerous persons have decided to live and work in Tarboro as a result of touring the area, and a major motion picture was filmed in the town in 1986.
- *Historic District Walking Tour.* The U.S. Department of the Interior designated a walking tour of the historic area as the Tarboro Historic District National Recreation Trail. Tourists are guided along the trail by a color brochure.
- *Renovation of the Blount-Bridgers House.* One of the

most significant accomplishments was the adaptive renovation of the Blount-Bridgers House (circa 1808) as a civic and cultural center. The three and one-half story mansion, built by revolutionary war General Thomas Blount, now serves as an art museum, tour headquarters, meeting facility, and recital hall, and is also leased for private parties and receptions. To fund this restoration, almost \$325,000 was raised by a local citizens committee that worked with town officials. Half of the total was donated by local businesses and individuals; the remaining funds came from public and private agencies and foundations. Operating funds come from annual contributions by the town of Tarboro, Edgecombe County, and private efforts.

In addition to preservation efforts in the Tarboro Historic District, revitaliza-



A home in the Tarboro Historic District.

tion projects were undertaken in two neighborhoods adjacent to downtown. Over \$5 million in public funds were invested in the Panola Heights area, a low- to moderate-income minority neighborhood, to improve homes, streets, water and sewer systems, storm drainage and flood control, and landscaping. As in the historic district, low-interest loans and grants to both homeowners and landlords resulted in a dramatically improved housing stock. Since a large portion of the neighborhood fell within a National Register Historic District, rehabilitations were sensitive to the historic elements of individual structures. In two cases, paint research on particularly significant houses was used to determine original Victorian colors and to serve as models for other renovations.

On the opposite side of downtown, the Deans Heights area, a low- to moderate-income mill village, also underwent revitalization. This project saw the investment of approximately \$3 million in public funds for street improvements, water and sewer line replacements, storm drainage improvements, landscaping, and rehabilitation. One turn-of-the-century mill house, threatened with demolition for a street-widening project, was moved and restored to its original appearance. The renovation served as a model for other rehabilitations by showing that historic preservation does not deal solely with the architecturally significant mansions of the well-to-do. Preservation can and must reflect the history of working people and their influence on the growth and development of an area.

The stabilization of the historic district, Panola Heights, and Deans Heights preserved a large residential population base that needed the services and goods of downtown. The next step was to strengthen the downtown itself.

Downtown Revitalization

In 1963, a plan for the redevelopment of downtown Tarboro called for the clearance of several blocks on either side of the commercial area for parking and future development. Fortunately this plan was shelved. The proposed demolitions would have leveled a large portion of the historic district and significant commercial buildings in lower downtown.

With funding provided by the CDBG program in 1975, the town began the planning effort needed to reverse the



Downtown revitalization.

steady decline of downtown Tarboro. When plans were completed, town leaders began the arduous task of packaging and seeking funds to implement a variety of public and private improvements for downtown. The first step was to tackle the most significant element of the downtown plans--attracting residential development.

By chance, two processes occurred in 1978. Town leaders wanted residential development; Howard Memorial Presbyterian Church wanted a quality life-care retirement center in Tarboro. Through careful negotiations, the ideas merged. Market studies convinced the church that downtown would be a good location for its facility. The town agreed to participate by seeking funds to acquire the necessary site and by taking steps to revitalize the surrounding commercial areas. Although this was a simple concept, it took almost two years to package the project.

In 1979, an application was filed with HUD for an Urban Development Action Grant (UDAG) that leveraged projected private investments of the Presbyterian retirement center, named *The Albemarle*, with public expenditures for overall downtown revitalization. The grant was awarded in 1980. The package included funds for site acquisition and installation of utilities for the Albemarle, acquisition and development of Riverfront Common, acquisition and development of three off-street parking lots, establishment of a low-interest loan program for commercial properties, installation of brick sidewalks and landscaping along Main

Street, various street improvements, and acquisition of deteriorated commercial buildings in lower downtown.

The funding for this program came from many sources. The UDAG itself amounted to \$2.66 million, which in turn leveraged \$3.39 million in other public investments and \$16.7 million in private funds, for a total of approximately \$23 million. For a town of 11,000 people such an investment had a tremendous impact on the local economy.

In 1980, the National Trust for Historic Preservation designated

Tarboro as one of only thirty cities nationwide to participate in the National Main Street Demonstration Program. This program solidified Tarboro's plan for weaving historic preservation into downtown revitalization and economic development.

The National Main Street Program was the catalyst



Housing rehabilitations in the Panola Heights area, a low-income minority neighborhood, were sensitive to the historic elements of individual structures.

needed to induce commitment from downtown merchants to support and participate in the revitalization effort. The Main Street approach has four focus areas--design, economic restructuring, promotion, and organization. Each element was incorporated into the downtown planning program and coordinated with activities planned under the UDAG project. Highlights of the more significant downtown projects include:

- *The Albemarle.* The \$14.4 million Albemarle Retirement Center, completed in 1984, contains 150 apartment units and forty skilled nursing beds. The complex is located on a seven-acre site adjacent to Main Street in the once-deteriorated lower downtown area, and its buildings are sensitive to the architecture and scale of downtown Tarboro. The facility offers a total, life-care environment for middle- to upper-income persons who come from Tarboro, eastern North Carolina, and several other states. The complex includes a medical and nursing wing, dining facility, auditorium, social and cultural rooms, a bank, beauty salon, and landscaped private courtyards. This town within a town has over 200 residents and approximately 120 employees.
- *Courthouse Square.* Courthouse Square, completed in 1981, created a major open space in the heart of downtown Tarboro. The \$700,000 project provided a beautifully landscaped green and a visual link from Main Street to the architecturally significant Edgecombe County Courthouse. Landscaping includes azalea beds, iron fencing, wide brick walkways, large trees and an oval reflecting pool for the courthouse.
- *Downtown Landscaping.* Landscaping along Main Street dramatically improved the visual quality of the downtown area. New brick sidewalks, restoration of the original art deco lamps, cast iron grates containing Darlington oaks, and underground utilities have unified the urban environment from Riverfront Common to the Town Common. The project, funded by the UDAG program, cost approximately \$700,000.
- *Downtown Renovation.* Downtown Tarboro, listed in the National Register of Historic Places, has numerous buildings that are both historically and architecturally significant. Through the Main Street program, free architectural assistance was provided to store owners to assure historically appropriate renovations. A program of reduced interest loans and grants (as well as federal

tax credits) offered private incentives. Private lending institutions in Tarboro set up a \$1.5 million loan pool, which produced more than thirty historically sensitive renovations. This rehabilitation program resulted in 343 new permanent jobs and 157 construction jobs.

- *Off-Street Parking.* To make downtown more accessible and competitive, funding was secured for the acquisition of land and construction of four off-street parking lots. The lots, designed to be as unobtrusive as possible, are hidden behind Main Street shops. Fencing and vegetation buffer the lots from the street. Several stores completed rear renovations to provide pedestrian access from the parking lots; however, parking and two-way vehicular access remain on Main Street. The planning department and downtown merchants determined that any removal of parking and vehicular access (or malling) on Main Street would greatly harm the marketability and economic health of downtown.
- *Riverfront Common.* The area around the Tar River, which forms the eastern boundary of downtown, had become overgrown and derelict over the years. With the Albemarle completed directly across the street, the town felt that the area should be improved, not only for use by Albemarle residents but for the enjoyment of all citizens. The development and landscaping of River-

front Common, part of the 1760 Town Common system, was completed in 1983. Most of the area was left in a natural state that features large cypress and poplar trees, while other areas were landscaped with azalea gardens and walking trails. Several dilapidated structures were acquired and demolished to create necessary open spaces and reclaim portions of the original public common.

One key aspect of the downtown urban design plan dealt with linkages of open spaces. These projects have created a

visual and pedestrian link between the Town Common on the western end of downtown and Riverfront Common on the eastern end. Courthouse Square forms a perpendicular axis in the center.

Conclusion

Tarboro's accomplishments are extraordinary in light of its size and economic base. A revitalization program such as the one in Tarboro takes time, often years, to reach fruition. It also takes long hours of work and great amounts of creativity, patience, and stamina--and funding, of course, is crucial. But other small towns can conceive and imple-



Courthouse square is the focal point of downtown Tarboro and best symbolizes its revitalization efforts.

ment similar programs.

Success often boils down to the personalities, degree of commitment, and leadership qualities of a handful of people, who take it upon themselves to really do something about their town's problems. The key to Tarboro's success was a team of dedicated community leaders who took some extraordinary measures. Remarkable projects resulted, and terrific economic gains were realized.

Planners in Tarboro spent many hours with representatives of communities from several states discussing the merging of historic preservation with downtown revitalization. After working with these delegations sent to learn "how Tarboro did it," it became easy to predict which of those communities could do it too. Survival for many small towns depends on community leaders that are willing to take creative measures to keep the town competitive. And the word *competitive* is used loosely, for there are many instances in which a small town can never regain the economic health of an earlier era.

Tarboro was aggressive in securing state, federal, and private grants. Of course, many governmental sources are no longer available or have been reduced. But regardless of the funding source, it is necessary to have a town planning staff that not only plans, but also seeks funding for the proposals outlined in the plans. Someone on the staff must keep abreast of changing laws and regulations and the variety of funding sources, both public and private, that are available for making an abstract proposal into a concrete reality. Creativity is a key word in this process. The most unlikely funding source quite often becomes the missing link in making a project workable.

Two additional points should be stressed regarding the Tarboro experience. First, good, solid planning is a prerequisite to successful project implementation. Second, area universities can provide excellent and affordable resources for smaller communities.

In Tarboro, much remains to be done (see *On the Horizon*, opposite). Even with all this effort, the town continues to be overshadowed economically by its larger, more dynamic neighbors. The keys to Tarboro's success are the recognition and understanding of its role in the region and the development of plans which accentuate and promote its historic small town atmosphere. □

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On the Horizon

Tarboro Planning Director Lorenzo Carmon says that "Downtown Tarboro is a bustling place from 8 to 5 on weekdays, but at night and on weekends it is a little quiet." He cites a special need for downtown restaurants and other attractions that will entice people to the area during non-business hours.

Additional grants and investments in downtown Tarboro may lead to some of these changes. The town recently received a \$100,000 grant from the N.C. Main Street Incentive Program, which will be used to fund additional downtown rehabilitation projects. The town hopes to rehabilitate thirteen to fifteen downtown properties by using these funds to make 10 percent incentive grants (in which 90 percent of the rehabilitation costs come from private funds). Through the combination of public and private monies, the town is expecting a total investment through this program of \$1.3 million.

New stores are going up on the "100" block of Main Street, across from the Albemarle. These structures are being built by a private developer on property purchased and cleared by the town through UDAG funds. Additional properties have been renovated in the "200" block.

Tarboro is fortunate to have a committed downtown merchants group, which meets weekly and plans downtown festivals and other events. The group began meeting actively when rumors of a suburban shopping mall began a couple of years ago. Though the mall has not been built, other shopping centers have been built on the outskirts of Tarboro in recent years.

Two structures on Main Street have been renovated and converted to mini-malls. Carmon notes that such mini-malls have not been successful nationally, but they have worked in Tarboro. In citing factors for this success, Carmon points out that the malls serve as a bridge between parking lots and Main Street businesses. In one of the mini-malls, most of the space is used for offices, while the other mini-mall is primarily retail.

Another important factor in assessing the health of downtown Tarboro is the number of persons employed there. As the county seat, there are numerous employees in county administrative offices, the county courthouse, and attorney's offices. Carolina Telephone has over 500 employees at its downtown Tarboro headquarters.

On the home front, residences in Tarboro continue to be renovated and restored. HUD 312 rehabilitation funds have been used to restore four homes in the historic district in the past few months. Additional assistance for homeowners in the historic district as well as in other neighborhoods should become available soon, under the restructured HUD 312 program.

Though sources of funds have changed, leaders and citizens in Tarboro continue to use innovative methods to secure the public and private funds needed to maintain the revitalization efforts begun over fifteen years ago.

-- Dale McKeel

Department News

Faculty Research

Raymond J. Burby and **Edward J. Kaiser**, with Linda Dalton and Steven P. French (Cal Poly-San Luis Obispo), John DeGrove and Craig Diamond (Florida Atlantic University/Florida International University), Philip Berke (Texas A & M University), and Peter May (University of Washington) have received funding from the National Science Foundation for a five-state comparative study of state planning mandates and their role in local governments' efforts to mitigate losses from natural hazards. The two-year study will compare the planning experiences of 90 local governments in three states with planning mandates (California, Florida, and North Carolina) with those of 60 local governments in two states without such mandates (Texas and Washington). DCRP doctoral students **Hilary Anthony** and **Dale Roenigk** are assisting with this research.

Raymond J. Burby and **Edward J. Kaiser**, assisted by doctoral students **Robert G. Paterson** and **Dale Roenigk** and MRP student **Maureen Heraty**, have received funding from the University of North Carolina Water Resources Research Institute for a study of the long-term financing and maintenance of urban stormwater management systems. The research team has completed a survey of the state of practice in over seventy North Carolina cities and investigated the actual condition of drainage systems in four cities. In the final stages of the study, a panel of experts will be asked to recommend management practices based on their combined experience.

David R. Godschalk is developing research proposals on the use of geographic information systems (GIS) to solve planning problems. He is working on potential GIS applications in the fields of coastal storm hazard mitigation and environmental management for estuarine areas, along with other planning faculty and graduate students. He is also preparing an article for publication based on his study of the national Coastal Zone Management Program from its enactment in 1972 through its fourth reauthorization in 1990.

Emil Malizia and doctoral student **Shanzi Ke** are developing a model that shows the connection between stability and diversity in local economies. Funded by a grant from the Economic Development Administration, U.S. Department of Commerce, the model will serve local governments as a guide to influence stability. The large-scale, data-intensive study includes 255 metropolitan areas in its examination of twenty-five variables effecting stability and twenty-five variables effecting diversity.

Historically, economic developers have focused on job creation and expansion of the tax base. In the 1980s, a decade which some experts have identified as a period of "rolling recession" (rolling from one part of the country to

the next), local leaders talked about economic stability as a relevant objective. And they identified economic diversity --less dependency on one industry--as a means of moderating the economic cycle fluctuation.

Although it may be a common sense notion to avoid "putting all your eggs in one basket," early findings of the study have demonstrated that the assumed relationship between diversity and stability does not necessarily hold true. The final report to the Economic Development Administration, due out in March 1991, will explain what the actual relationship is, perhaps identifying other benefits to diversity.

Emil Malizia and joint MRP/MBA student **Debbie Burkart** are studying market factors, such as financing and legislation, that affect accessible housing. This work is being done for the Center for Accessible Housing at the School of Design, North Carolina State University.

The Center is the only one of its kind dedicated to improving the usability, availability and affordability of housing for disabled persons. The national supply of accessible housing is low, and design training and information on the topic is scarce. Funded by the National Institute on Disability and Rehabilitation Research of the U.S. Department of Education, the Center serves individuals and organizations requesting technical assistance, training or published information. Its research and development programs include studies of disabled persons' impairments and mobility, examination of existing accessible housing, development and testing of new designs for accessible housing, and market factors affecting accessible housing.

Malizia and Burkart are studying supply-side market factors, attempting to identify who provides accessible housing, what the costs are, how much is available, and what it looks like. Now in its second year, the study will be impacted by recent passages of the American Disabilities Act and the Fair Housing Amendments.

Collaborating with DCRP and the NCSU School of Design are Barrier Free Environments, Inc., Raleigh; The Rehabilitation Research and Development Center of the Atlanta Veterans Affairs Medical Center; and The Adaptive Environments Center, Boston, Massachusetts.

Michael Luger and **Harvey Goldstein** have recently completed a study, sponsored by the Ford Foundation, of the regional economic impacts of investments in research parks. Many state governments created research parks within the last ten years with the hopes and expectations that they will stimulate high technology development in their respective regions. Luger and Goldstein analyzed the net economic impact of 115 such research parks in the U. S. using a combination of case study and econometric methods.

There are several principal conclusions of the study. First, there is wide variation among research parks in their degree of "success" in stimulating regional economic de-

velopment. Second, the most important success factors include age, or vintage, of the research park (the earlier the park, the more likely to be successful), the degree of concentration of R & D activity already in the region, affiliation with a proximate research university, the extent to which park management takes an active role in providing services to the organizations in the park, and the "leadership" factor--the degree of patience, commitment, and ability to work together among high-level political, business, and academic officials. Third, in three well-known cases of success--the Research Triangle Park (RTP), Stanford Research Park, and the University of Utah Research Park--income inequality did not increase in RTP and the Salt Lake City region, nor did the relative economic well-being of women and minorities worsen. In the Stanford region, the degree of income inequality increased a small amount as a result of the development stimulated by the research park.

Luger and Goldstein warn that there is very limited transferability of success cases such as RTP and Stanford Research Park to other places, nor are there any general recipes for stimulating economic development through investments in research parks. For many regions, other strategies, including manufacturing modernization and investment in human capital, represent a more effective, long-term approach to developing a region's technological and innovative capacity.

The University of North Carolina Press will be publishing a revised version of the study, entitled *Technology in the Garden*, to appear in the summer of 1991.

Jonathan B. Howes has initiated two studies dealing with aspects of planning and politics in the Research Triangle region. Working with MPA student **Katherine Crapps**, Howes is interviewing Triangle-area mayors and managers, focusing on relationships among them during local election campaigns and mayoral transitions. Working with MRP student **Brenda Linton**, he is beginning a study of the recent planning history of the Triangle area. Through

interviews with planners from the several jurisdictions and agencies in the area, Howes will compile an oral history of the region's planning.

Raymond J. Burby has received a Kenan competitive leave from UNC and Fulbright Senior Scholar award for research in Australia during the spring semester of 1991. Burby will work with planning researchers at the University of New South Wales near Sydney on a cross-national (Australia-United States) study of community adaptation to sea-level rise and other aspects of global warming.

1990 Alumni Association Annual Conference

The Alumni Association of the Department of City and Regional Planning, University of North Carolina at Chapel Hill, held its annual conference and business meeting on October 26 and 27, 1990. The highlights of the weekend were a geographic information systems workshop and a panel forum featuring the Hubert H. Humphrey Fellows.

Geographic Information Systems Workshop

The DCRP Alumni Association sponsored an introductory geographic information systems (GIS) workshop as part of the annual conference. The two-day workshop was taught by planning faculty, staff, and graduate students who developed a similar course for IBM. Instructors included **David Godschalk**, **Edward Kaiser**, **Jerry McMahon**, **Wei Quin**, and **Bruce Egan**.

Panel with Hubert H. Humphrey Fellows

The University of North Carolina at Chapel Hill and the Department of City and Regional Planning have been selected to host the Hubert H. Humphrey North-South Fellowship Program, a Fulbright exchange sponsored by the U.S. Information Agency. The program brings accomplished professionals from developing countries to the United States for a year of study and related practical professional experiences.

On Saturday, October 27, Humphrey Fellow **Victoria Mendez-Charles** presented a paper prepared by the Fellows, entitled "Changing International Focus--Some Issues of Underdevelopment." Following this presentation, the Fellows discussed ways in which recent global political and economic changes have affected their work and their nations. The Humphrey Fellows participating in the panel forum were **Taslim Arifin** (Indonesia), **Despina Kakogiannakis** (Greece), **Kifle Lemma** (Ethiopia), **Kentigern Louis** (St. Lucia, W.I.), **Pacifico F. Maghacot, Jr.** (Philippines), **Sergio Mariano da Silva** (Brazil), **Victoria Mendez-Charles** (Trinidad and Tobago), and **Aloysius G.T. Nyenza** (Tanzania).



The Hubert H. Humphrey Fellows (with program coordinator Linda Lacey, second from left) during the "Changing International Focus" panel forum.

Carolina Planning Index: 1984 to 1990

Prepared by John P. Gliebe and Margaret C. Stewart

Issues Included in Index

Volume 10, No. 2,	Fall 1984:	Development Strategies for Urban Economies
Volume 11, No. 1,	Summer 1985:	After the Storm: Planning for Disaster
Volume 11, No. 2,	Winter 1985:	Issues in Housing & Community Development
Volume 12, No. 1,	Summer 1986:	Development Dispute Resolution
Volume 12, No. 2,	Winter 1986:	General
Volume 13, No. 1,	Fall 1987:	Cost Recovery Fees
Volume 14, No. 1,	Spring 1988:	Planning in Developing Countries
Volume 14, No. 2,	Fall 1988:	Economic Development in North Carolina
Volume 15, No. 1,	Spring 1989:	Historic Preservation
Volume 15, No. 2,	Fall 1989:	Emerging Planning Issues
Volume 16, No. 1,	Spring 1990:	Politics and Planning
Volume 16, No. 2,	Fall 1990:	General

Note: Volume 13 contained only one issue (Fall 1987). An index previously appeared in Volume 10, No. 1 (Summer 1984).

BOOK REVIEWS

City: Rediscovering the Center, by William Whyte. Reviewed by Robert E. Ansley. Volume 16, No. 1, Spring 1990, p. 80.

Civil Rights: Rhetoric or Reality? by Thomas Sowell. Reviewed by Brad Torgan. Volume 11, No. 1, Summer 1985, pp. 46-47.

Downtown Retail Development: Conditions for Success and Project Profiles, by Andrew Alpern and Seymour Durst. Reviewed by Ted Olin Harrison. Volume 10, No. 2, Fall 1984, p. 42.

Holdouts! by J. Thomas Black, Libby Howland, and Stuart L. Rogel. Reviewed by Ted Olin Harrison. Volume 10, No. 2, Fall 1984, p. 41.

Housing and Urban Development in the USSR, by Gregory D. Andresz. Reviewed by Laura Bachle. Volume 11, No. 1, Summer 1985, pp. 47-48.

The State Against Blacks, by Walter Williams. Reviewed by Brad Torgan. Volume 11, No. 1, Summer 1985, pp. 46-47.

Successful Negotiating in Local Government, edited by Nancy A. Huelsberg and William F. Lincoln. Reviewed by Gail Fischman. Volume 12, No. 1, Summer 1986, pp. 39-40.

The Unsheltered Woman, by Eugenie Ladner Birch. Reviewed by Jamie Englund. Volume 11, No. 2, Winter 1985, pp. 52-53.

COASTAL ISSUES

"The Brief Life and Hard Times of the Coastal Plains Regional Commission," by Pat Dusenbury. Volume 11, No. 1, Summer 1985, pp. 6-9.

"The Effects of Global Warming and Sea-Level Rise on Coastal North Carolina," by R. Paul Wilms. Volume 16, No. 2, Fall 1990, pp. 44-49.

"Hazard Reduction Through Development Management in Hurricane-Prone Localities: State of the Art," by Timothy Beatley and David R.

Godschalk. Volume 11, No. 1, Summer 1985, pp. 19-27, 42.

"Out of the Closet and Onto the Coast: Aesthetic Zoning as Visual Resource Management," by David J.L. Blatt. Volume 12, No. 2, Winter 1986, pp. 34-43.

"Planners as Leaders," by Mary Joan Manley Pugh. Volume 16, No. 1, Spring 1990, pp. 48-53.

"Planning for Water Quality in the Coastal Zone," by Kathleen Leyden. Volume 11, No. 1, Summer 1985, pp. 3-4.

"Pre-Storm Mitigation and Post-Storm Reconstruction: A Plan for Nags Head," by Bruce M. Bortz. Volume 16, No. 2, Fall 1990, pp. 15-18.

"Putting Visual Impact Assessment to Work," by Gail Fischman. Volume 12, No. 2, Winter 1986, pp. 25-33.

"Redevelopment After the Storm: Hazard Mitigation Opportunities and Obstacles in the Post-Disaster Setting," by Jane L. Hegenbarth and David J. Brower. Volume 11, No. 1, Summer 1985, pp. 28-35, 43.

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COMMUNITY DEVELOPMENT

"Applying the Rational Planning Model to Recreation Planning in Soul City," by Jon Lockman and Mary Peloquin-Dodd. Volume 13, No. 1, Fall 1987, pp. 5-11.

"Art, History and Public Space: Buster Simpson on Stewardship," by Buster Simpson. Edited by Elizabeth Morton. Volume 15, No. 1, Spring 1989, pp. 43-49.

"Community Impacts of New Industrial Development," by Harvey Goldstein. Volume 11, No. 2, Winter 1985, pp. 29-39.

Downtown Retail Development: Conditions for Suc-

cess and Project Profiles, by Andrew Alpern and Seymour Durst. Reviewed by Ted Olin Harrison. Volume 10, No. 2, Fall 1984, p. 42.

"Harnessing Suburban Resources," by Patrick Hare and Gail Price. Volume 11, No. 2, Winter 1985, pp. 21-28.

"No Voice, No Choice: Community Group Involvement in London's Metropolitan Strategic Planning Process," by Judith Allen. Volume 14, No. 1, Spring 1988, pp. 23-29.

"Opening Closed Doors: Worker-Ownership Initiatives," by Carol B. Solow. Volume 11, No. 1, Summer 1985, pp. 4-5, 44.

"Profile of a Successful Negotiation: The Crest Street Experience," by Laura D. Bachle, Laura Hill, and Tim Nifong. Volume 12, No. 1, Summer 1986, pp. 25-33.

"A Real Massachusetts Miracle: Local Affordable Housing Partnerships," by Monte Franke. Volume 16, No. 1, Spring 1990, pp. 68-72.

"Recent Cases of the Progressive City," by Pierre Clavel. Volume 16, No. 1, Spring 1990, pp. 64-67.

"Urban Harvest," by Tracy Hood. Volume 11, No. 2, Winter 1985, pp. 44-51.

"Will Others Jump on the Rouse Bandwagon This Time," by Stacey Ponticello and Norman Acker. Volume 11, No. 2, Winter 1985, pp. 40-43.

DEVELOPING AREAS

"Agricultural Colonization and the Social Dimension of Ecological Destruction in Ecuador's Amazonia," by Francisco J. Pichon. Volume 15, No. 2, Fall 1989.

"Development on the Urban Fringe: Recent Chinese Experience," by Simon Powell. Volume 14, No. 1, Spring 1988, pp. 15-22.

"Meeting the Needs of Developing Countries: Introducing a New Program of Study," by Linda Lacey. Volume 14, No. 1, Spring 1988, pp. 39-40.

"Planning Curriculum: Meeting the Challenge," by

Dale Whittington, John Cook, Michael A. Stegman, and Emil Malizia. Volume 11, No. 2, Winter 1985, pp. 6-8.

"Population: A Key Component of Planning Education for Developing Countries," by Linda Lacey. Volume 14, No. 1, Spring 1988, pp. 30-38.

"Reflections on Donor Coordination: An Attempt to Establish a Microcomputer-Based Development Project Directory in Sudan," by Dale Whittington and Craig Calhoun. Volume 14, No. 1, Spring 1988, pp. 8-14.

"Sustainable Transportation for Developing Countries," by Ken Hughes and Michael Replegle. Volume 15, No. 2, Fall 1989, pp. 26-31.

DISASTER MANAGEMENT

"Hazard Mitigation Planning," by Timothy Beatley. Volume 10, No. 2, Fall 1984, pp. 3-4.

"Hazard Reduction Through Development Management in Hurricane-Prone Localities: State of the Art," by Timothy Beatley and David R. Godschalk. Volume 11, No. 1, Summer 1985, pp. 19-27, 42.

"Pre-Storm Mitigation and Post-Storm Reconstruction: A Plan for Nags Head," by Bruce M. Bortz. Volume 16, No. 2, Fall 1990, pp. 15-18.

"Sharing Emergency Management Planning Assumptions: Management Views Differ," by Jack D. Kartez, Liese Hunter, and William J. Kelley. Volume 11, No. 1, Summer 1985, pp. 10-18, 45.

"Redevelopment After the Storm: Hazard Mitigation Opportunities and Obstacles in the Post-Disaster Setting," by Jane L. Hegenbarth and David J. Brower. Volume 11, No. 1, Summer 1985, pp. 28-35, 43.

DISPUTE RESOLUTION AND NEGOTIATION

"Building Preservation Coalitions--The Arts and Preservation: A Natural Affinity," by Marjorie K.N. Salzman. Volume 15, No. 1, Spring 1989, pp. 22-24.

"Building Preservation Coalitions--Land Trusts: Focusing Limited Resources on Common Interests," by Kathleen A. Blaha. Volume 15, No. 1, Spring 1989, pp. 13-15.

"Building Preservation Coalitions--A Local Government Perspective," by Jeffrey Swain and Kathryn Sette. Volume 15, No. 1, Spring 1989, pp. 16-21.

"Conflict in the Context of Everyday Practice," by John Forester. Volume 12, No. 1, Summer 1986, pp. 3-4.

"Evolution of Public-Private Bargaining in Urban Development," by William Fulton. Volume 12, No. 1, Summer 1986, pp. 10-17.

"Justice in the Community: Strategies for Dispute Resolution," by Rob Gelblum. Volume 11, No. 1, Summer 1985, pp. 36-41.

"Local Dispute Settlement Centers: Helping Planners to Build Consensus," by Andy Sachs. Volume 16, No. 1, Spring 1990, pp. 35-39.

"Painful Lessons From Piney Mountain: A Framework for Development Dispute Resolution," by Jim Holway and John Hodges-Copple. Volume 12, No. 1, Summer 1986, pp. 18-24.

"Profile of a Successful Negotiation: The Crest Street Experience," by Laura D. Bachle, Laura Hill, and Tim Nifong. Volume 12, No. 1, Summer 1986, pp. 25-33.

"Smoothing Out the Approval Process: A Developer's Viewpoint," by Stacey A. Ponticello and Russell Berusch. Volume 12, No. 1, Summer 1986, pp. 5-9.

"Some Thoughts on Planners and the New Dispute Resolution," by David R. Godschalk. Volume 12, No. 1, Summer 1986, pp. 41-42.

Successful Negotiating in Local Government, edited by Nancy A. Huelsberg and William F. Lincoln. Reviewed by Gail Fischman. Volume 12, No. 1, Summer 1986, pp. 39-40.

"Watershed Protection: Problems and Possibilities," by Judith Welch Wegner. Volume 16, No. 2, Fall 1990, pp. 19-27.

"When and How to Negotiate," by Denise Madigan, Gerard McMahon, Stephanie Rolley, and Lawrence Susskind. Volume 12, No. 1, Summer 1986, pp. 35-38.

ECONOMIC DEVELOPMENT

"Balancing Environmental Protection and Economic Development: What Do North Carolinians Want?," by Frank K. Brown. Volume 16, No. 2, Fall 1990, p. 14.

"A Dance of Economic Development: The Arts Strategy," by Les Garner. Volume 10, No. 2, Fall 1984, pp. 18-23.

"Downtown Revitalization and Historic Preservation in Small Town America: A Case Study of Tarboro, North Carolina," by E. Watson Brown and Wes Hankins. Volume 16, No. 2, Fall 1990, pp. 50-54.

"Encouraging Business Start-ups in North Carolina: An Interview with Professor Dick Levin," by Heidi Walter Powell. Volume 14, No. 2, Fall 1988, pp. 26-30.

"Foresight: Catawba County, North Carolina--Planning its Economic Future," by Thomas Lundy. Volume 14, No. 2, Fall 1988, pp. 39-42.

"The Future of Economic Development in the South: Addressing the Consequences of Our Past," by Jesse L. White, Jr. Volume 14, No. 2, Fall 1988, pp. 15-21.

"Growth Strategies: The New Planning Game in Georgia," by Arthur C. Nelson. Volume 16, No. 2, Fall 1990, pp. 4-8.

"The Mosaic of Economic Development: Local Pieces of a National Whole," by Emil Malizia. Volume 10, No. 2, Fall 1984, pp. 43-44.

"The Myth of Balanced Growth: Redistributing North Carolina's Infrastructure Dollars," by Representative Josephus Mavretic. Volume 14, No. 2, Fall 1988, pp. 22-25.

"Planning Curriculum: Meeting the Challenge," by Dale Whittington, John Cook, Michael A. Stegman, and Emil Malizia. Volume 11, No. 2, Winter 1985, pp. 6-8.

"Planning from the Bottom Up: An Interview with Professor Walter Stöhr," by Elizabeth Morton and Heidi Walter Powell. Volume 14, No. 1, Spring 1988, pp. 3-7.

"Small Business Incubators: A Tool for Economic Development," by Robert D. Atkinson. Volume 14, No. 2, Fall 1988, pp. 31-38.

"Strategic Plays: A Model for Organizational Planning," by Emil Malizia. Volume 10, No. 2, Fall 1984, pp. 15-17.

"Street Bargaining: The Politics of Chicago Planning," by Joe Zehnder. Volume 10, No. 2, Fall

1984, pp. 6-9, 40.

"From Textiles to Transistors: Education and Training for a New Economy," by Kathleen Heady. Volume 10, No. 2, Fall 1984, pp. 24-28.

ENVIRONMENT

"Agricultural Colonization and the Social Dimension of Ecological Destruction in Ecuador's Amazonia," by Francisco J. Pichon. Volume 15, No. 2, Fall 1989, pp. 42-48.

"Balancing Environmental Protection and Economic Development: What Do North Carolinians Want?," by Frank K. Brown. Volume 16, No. 2, Fall 1990, p. 14.

"The Effects of Global Warming and Sea-Level Rise on Coastal North Carolina," by R. Paul Wilms. Volume 16, No. 2, Fall 1990, pp. 44-49.

"Greenway Use and Users: An Examination of Raleigh and Charlotte Greenways," by Owen J. Furuseth and Robert E. Altman. Volume 16, No. 2, Fall 1990, pp. 37-43.

"The Impact of Environmental Liability on Land Use Planning," by John Buckley. Volume 15, No. 2, Fall 1989, pp. 49-53.

"Integrated Waste Management: The Mecklenburg County Experience," by Elizabeth W. Dorn. Volume 15, No. 2, Fall 1989, pp. 3-7.

"Is Your Water Supply Protected?," by Edward J. Kaiser. Volume 12, No. 2, Winter 1986, pp. 50-52.

"A Nonlinear Approach to Open Space," by William L. Flournoy, Jr. Volume 15, No. 1, Spring 1989, pp. 50-54.

"Planning for Endangered Species: On the Possibilities of Sharing a Small Planet," by Timothy Beatley. Volume 15, No. 2, Fall 1989, pp. 32-41.

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"Preservation Without the 'Z' Word," by Diane E. Lea and Robert M. Leary. Volume 15, No. 1, Spring 1989, pp. 55-62.

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- "Building Preservation Coalitions--Land Trusts: Focusing Limited Resources on Common Interests," by Kathleen A. Blaha. Volume 15, No. 1, Spring 1989, pp. 13-15.
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- "Growth Strategies: The New Planning Game in Georgia," by Arthur C. Nelson. Volume 16, No. 2, Fall 1990, pp. 4-8.
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- "The Politics of Planning a Growth Management System: The Key Ingredients for Success," by John M. DeGrove. Volume 16, No. 1, Spring 1990, pp. 26-34.
- "Preservation Without the 'Z' Word," by Diane E. Lea and Robert M. Leary. Volume 15, No. 1, Spring 1989, pp. 55-62.
- "Preserving A Special Place: Growth Management in Fort Mill, South Carolina," by Kenneth C. Driggers. Volume 15, No. 1, Spring 1989, pp. 4-9.
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NEGOTIATION--See DISPUTE RESOLUTION AND NEGOTIATION

PLANNING METHOD

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- "From Planning Practice to Academia," by Norman Krumholz. Volume 12, No. 2, Winter 1986, pp. 18-24.
- "Mental Barriers to Creativity and Learning in Transportation Planning," by Jonathan Richmond. Volume 13, No. 1, Fall 1987, pp. 42-

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- "Preservation Without the 'Z' Word," by Diane E. Lea and Robert M. Leary. Volume 15, No. 1, Spring 1989, pp. 55-62.
- "Privatization of Public Housing Projects Using Section 123 of the HCD Act of 1987," by Dennis Eisen. Volume 15, No. 2, Fall 1989, pp. 14-18.
- "Putting Visual Impact Assessment to Work," by Gail Fischman. Volume 12, No. 2, Winter 1986, pp. 25-33.
- "Strategic Plays: A Model for Organizational Planning," by Emil Malizia. Volume 10, No. 2, Fall 1984, pp. 15-17.

PLANNING THEORY

- "Fear and Loathing in the Planning Profession: Ten Comments on the Political Factor," by Charles G. Pattison. Volume 16, No. 1, Spring 1990, pp. 12-16.
- "An Interview with Harvey Gantt," by Trina Gauld and Dale McKeel. Volume 16, No. 1, Spring 1990, pp. 3-7.
- "Planners and Politics: Reflections on Twenty-Seven Years," by Jonathan B. Howes. Volume 14, No. 2, Fall 1988, pp. 49-50.
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- "The Politics of Design," by Norma DeCamp Burns. Volume 16, No. 1, Spring 1990, pp. 17-20.
- "Of Ships and Seaweed," by Glenn R. Harbeck. Volume 13, No. 1, Fall 1987, pp. 3-4.
- "Some Thoughts From the President: An Interview with Norman Krumholz," by Russell Berusch and Heidi Walker. Volume 12, No. 2, Winter 1986, pp. 13-17.
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POLICY

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- "Cost Recovery Fees: A Proposal for Wilmington, North Carolina," by Scott Shuford. Volume 13, No. 1, Fall 1987, pp. 30-41.
- "The Durham Cooperative Planning Initiative," by Robert G. Paterson. Commentary by A. Paul Norby. Volume 16, No. 1, Spring 1990, pp. 54-63.
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- "Growth Strategies: The New Planning Game in Georgia," by Arthur C. Nelson. Volume 16, No. 2, Fall 1990, pp. 4-8.
- "Out of the Closet and Onto the Coast: Aesthetic Zoning as Visual Resource Management," by David J.L. Blatt. Volume 12, No. 2, Winter 1986, pp. 34-43.
- "Pedaling into the Future," by Marcia D. Lowe. Volume 15, No. 2, Fall 1989, pp. 19-25.
- "Planning for Endangered Species: On the Possibilities of Sharing a Small Planet," by Timothy Beatley. Volume 15, No. 2, Fall 1989, pp. 32-41.

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- "A Thought for the Growing South," by Lewis Mumford. Reprinted from *A Southern Packet*, April 1949. Commentary by David R. Godschalk. Volume 15, No. 2, Fall 1989, pp. 62-66.
- "Watershed Protection: Problems and Possibilities," by Judith Welch Wegner. Volume 16, No. 2, Fall 1990, pp. 19-27.
- "Who Bears the Cost?," by Charles Siemon. Volume 13, No. 1, Fall 1987, pp. 22-29.

PUBLIC PARTICIPATION

- "Conflict in the Context of Everyday Practice," by John Forester. Volume 12, No. 1, Summer 1986, pp. 3-4.
- "Justice in the Community: Strategies for Dispute Resolution," by Rob Gelblum. Volume 11, No. 1, Summer 1985, pp. 36-41.
- "Local Dispute Settlement Centers: Helping Planners to Build Consensus," by Andy Sachs. Volume 16, No. 1, Spring 1990, pp. 35-39.
- "No Voice, No Choice: Community Group Involvement in London's Metropolitan Strategic Planning Process," by Judith Allen. Volume 14, No. 1, Spring 1988, pp. 32-29.
- "Painful Lessons From Piney Mountain: A Framework for Development Dispute Resolution," by Jim Holway and John Hodges-Copple. Volume 12, No. 1, Summer 1986, pp. 18-24.
- "Profile of a Successful Negotiation: The Crest Street Experience," by Laura D. Bachle, Laura Hill, and Tim Nifong. Volume 12, No. 1, Summer 1986, pp. 25-33.

REGIONAL ISSUES

- "The Future of Economic Development in the South: Addressing the Consequences of Our Past," by Jesse L. White, Jr. Volume 14, No. 2, Fall 1988, pp. 15-21.
- "The Myth of Balanced Growth: Redistributing North Carolina's Infrastructure Dollars," by Representative Josephus Mavretic. Volume 14, No. 2, Fall 1988, pp. 22-25.
- "The Triangle Has Responsibilities as a World Class Region," by Edward M. Bergman. Volume 14, No. 2, Fall 1988, p. 14.
- "A World Class Region: Putting Vision Into Action," by Raymond J. Green. Volume 14, No. 2, Fall 1988, pp. 10-13.

RURAL AND SMALL TOWN PLANNING

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- "Avery County Growth Management Program:

The Evolution of Planning in a Western North Carolina County," by David H. Quinn. Volume 16, No. 2, Fall 1990, pp. 9-13.

- "Downtown Revitalization and Historic Preservation in Small Town America: A Case Study of Tarboro, North Carolina," by E. Watson Brown and Wes Hankins. Volume 16, No. 2, Fall 1990, pp. 50-54.
- "Foresight: Catawba County, North Carolina--Planning its Economic Future," by Thomas Lundy. Volume 14, No. 2, Fall 1988, pp. 39-42.
- "Preserving A Special Place: Growth Management in Fort Mill, South Carolina," by Kenneth C. Driggers. Volume 15, No. 1, Spring 1989, pp. 4-9.
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- "Successful Land Use Planning for Small Towns: A Case Study of Bath, North Carolina," by Terry W. Alford, Dale Downes, and Sarah Woodworth. Volume 12, No. 2, Winter 1986, pp. 44-48.

SOCIAL SERVICES PLANNING

- "Harnessing Suburban Resources," by Patrick Hare and Gail Price. Volume 11, No. 2, Winter 1985, pp. 21-28.

TRANSPORTATION AND INFRASTRUCTURE PLANNING

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- "Cost Recovery Fees: A Proposal for Wilmington, North Carolina," by Scott Shuford. Volume 13, No. 1, Fall 1987, pp. 30-41.
- "The Legal Issues of Serving New Development," by Thomas P. Snyder. Volume 11, No. 2, Winter 1985, pp. 12-20.
- "Mental Barriers to Creativity and Learning in Transportation Planning," by Jonathan Richmond. Volume 13, No. 1, Fall 1987, pp. 42-54.
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- "Pedaling into the Future," by Marcia D. Lowe. Volume 15, No. 2, Fall 1989, pp. 19-25.
- "Sustainable Transportation for Developing Countries," by Ken Hughes and Michael Replogle. Volume 15, No. 2, Fall 1989, pp. 26-31.
- "Who Bears the Cost?," by Charles Siemon. Volume 13, No. 1, Fall 1987, pp. 22-29.

URBAN DESIGN

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- "The Politics of Design," by Norma DeCamp Burns. Volume 16, No. 1, Spring 1990, pp. 17-20.
- "Vernacular Architecture and the Preservation of Local Cultural Identity," by John C. Larson. Volume 15, No. 1, Spring 1989, pp. 36-42.

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